U.S. Army Research Institute
for the Behavioral and Social Sciences

Research Report 1695

Training in a Digitized Battalion Task Force: Lessons Learned and Implications for Future Training

Gary S. Elliott, William R. Sanders, and Kathleen A. Quinkert
U.S. Army Research Institute

June 1996

U.S. ARMY RESEARCH INSTITUTE
FOR THE BEHAVIORAL AND SOCIAL SCIENCES

A Field Operating Agency Under the Jurisdiction of the Deputy Chief of Staff for Personnel

EDGAR M. JOHNSON
Director

Technical review by

William M. Parry
Bruce Sterling
Dennis C. Wightman

REPORT DOCUMENTATION PAGE

1. REPORT DATE	2. REPORT TYPE	3. DATES COVERED (from. . . to)
1996, June	Final	January 1995-November 1995

4. TITLE AND SUBTITLE	5a. CONTRACT OR GRANT NUMBER
Training in a Digitized Battalion Task Force: Lessons Learned and Implications for Future Training	5b. PROGRAM ELEMENT NUMBER 0602785A
6. AUTHOR(S)	5c. PROJECT NUMBER A791
Gary S. Elliott, William R. Sanders, and Kathleen A. Quinkert	5d. TASK NUMBER 2228
	5e. WORK UNIT NUMBER H01

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)	8. PERFORMING ORGANIZATION REPORT NUMBER
U.S. Army Research Institute for the Behavioral and Social Sciences ATTN: PERI-RZA 5001 Eisenhower Avenue Alexandria, VA 22333-5600	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)	10. MONITOR ACRONYM
U.S. Army Research Institute for the Behavioral and Social Sciences 5001 Eisenhower Avenue Alexandria, VA 22333-5600	ARI
	11. MONITOR REPORT NUMBER Research Report 1695

12. DISTRIBUTION/AVAILABILITY STATEMENT

Approved for public release; distribution is unlimited.

13. SUPPLEMENTARY NOTES

14. ABSTRACT *(Maximum 200 words)*:

The Mounted Battlespace Battle Lab conducted the Advanced Warfighting Experiment Focused Dispatch in 1995 to examine the impact of the integration of digital systems on a Battalion Task Force organization, doctrine, and warfighting capabilities. This report augments the Focused Dispatch efforts and provides information that pertains to unit training with digital systems. The objectives of this research were to: (1) document the unit's training efforts, (2) capture the lessons learned, and 93) identify implications for future Force XXI training efforts. Data were collected using structured observations, surveys, and interviews. Lessons learned and implications identified were in nine key areas: training strategy, training management, training methods, prerequisite skills and knowledge, digital learning centers, simulation training, training literature, training assessment, and training support..

15. SUBJECT TERMS

Digital Command and Control Training Lessons learned
Force XXI AWE Focused Dispatch

SECURITY CLASSIFICATION OF			19. LIMITATION OF ABSTRACT	20. NUMBER OF PAGES	21. RESPONSIBLE PERSON (Name and Telephone Number)
16. REPORT	17. ABSTRACT	18. THIS PAGE			
Unclassified	Unclassified	Unclassified	Unlimited	200	

Research Report 1695

Training in a Digitized Battalion Task Force: Lessons Learned and Implications for Future Training

Gary S. Elliott, William R. Sanders, and Kathleen A. Quinkert
U.S. Army Research Institute

Armored Forces Research Unit
Barbara A. Black, Chief

U.S. Army Research Institute for the Behavioral and Social Sciences
5001 Eisenhower Avenue, Alexandria, Virginia 22333-5600

Office, Deputy Chief of Staff for Personnel
Department of the Army

June 1996

Army Project Number
2O262785A791

Education and Training Technology

FOREWORD

The U.S. Army is currently conducting a campaign to develop the Army of the 21st Century--Force XXI. The Army has recognized that it must exploit the enhanced capabilities of modern information systems to ensure success in future operations. To support this campaign, the U.S. Training and Doctrine Command's (TRADOC) Mounted Battlespace Battle Lab (MBBL) conducted the Advanced Warfighting Experiment (AWE) Focused Dispatch (FD) to examine the impact of integrating digital systems on the battalion task force organization, doctrine, and warfighting capabilities. Effective soldier and unit training for emerging digital technologies are essential to the successful conduct of AWEs and the broader Force XXI objectives.

The goal of this research was to document the battalion task force digital systems training effort for AWE FD. The research sought to: document the training that took place, capture training lessons learned, and identify implications for future Force XXI training efforts.

The present research yielded lessons learned and implications for future programs that address nine key areas of training: training strategy, training management, training methods, prerequisite skills and knowledge, digital learning centers, simulation training, training literature, training assessment, and training support. Portions of this report and the findings were incorporated into the AWE FD After Action Review report published by the MBBL.

This research was performed by the Future Battlefield Conditions Team of the Fort Knox Armored Forces Research Unit (AFRU) of the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) under Work Package 2228, Force XXI Training Methods and Strategies (FASTRAIN). ARI's research is supported by a Memorandum of Agreement between the U.S. Army Armor Center (USAARMC) Fort Knox and ARI titled Manpower, Personnel and Training Research, Development, Test, and Evaluation for the Mounted Forces, 16 October 1995.

ZITA M. SIMUTIS
Deputy Director
(Science and Technology)

EDGAR M. JOHNSON
Director

ACKNOWLEDGEMENTS

The authors would like to express their appreciation to the soldiers of the Battalion Task Force 2-33 Armor, 16th Cavalry Regiment, U.S. Army Armor School for allowing the Future Battlefield Conditions Team access to their training efforts for the Advanced Warfighting Experiment Focused Dispatch. We are especially grateful to the Task Force 2-33 Armor Commander, LTC Joe Orr, for supporting our observation and data collection efforts. MAJ Ron Harper (Battalion Executive Officer), MAJ Andy Dreby (Battalion Operations Officer), CPT Tom Deakins (Assistant Operations Officer), CPT Jeff LaFace (B Company Commander), 1LT Chad Ford (Battalion Chemical Officer) and 2LT Mike Vivian (Battalion Operations Shop) are acknowledged for their assistance in providing in-depth training, equipment, and operations information that facilitated understanding of the battalion training efforts.

Special appreciation is extended to Dr. Carl Lickteig (U.S. Army Research Institute, Armored Forces Research Unit, Future Battlefield Conditions Team) for his assistance in monitoring and recording training information during this effort. Sincere gratitude is expressed to Ms. May Throne, a Consortium Research Fellow from the University of Louisville, for providing preliminary graphics and tables support for this document.

TRAINING IN A DIGITIZED BATTALION TASK FORCE: LESSONS LEARNED AND IMPLICATIONS FOR FUTURE TRAINING

EXECUTIVE SUMMARY

Research Requirement:

The U.S. Army has embarked on a campaign to transform today's Army into a 21st Century force (Force XXI). Leaders of today's Army have recognized that the force of tomorrow must be capable of harnessing and exploiting information and information systems to be successful in future operations. To support this effort, the Army has instituted a series of Advanced Warfighting Experiments (AWEs). The AWE Focused Dispatch (FD) was initiated to examine the impact of digitization and interconnectivity on battalion task force organization, doctrine, processes, and functions and how it affected warfighting capabilities. A necessary prerequisite for conducting a successful AWE was that the unit be trained and proficient in all areas to include digital operations. It was deemed critical to capture and document the training process and any insights appropriate for future training efforts. The focus of this research effort was to (a) document the battalion task force digital training preparation during the AWE FD, (b) derive training lessons learned, and (c) examine the implications for future Force XXI training methods and strategies.

Procedure:

Several approaches to collect unit training information during home-station training were used. Unit participation in virtual, constructive, and live training events and experiments were monitored and data were captured manually using loosely structured guidelines. Participants were questioned on-site after events to clarify training information. Summary follow-up questionnaires and interviews, tailored to specific events and soldier's perceptions about training and lessons learned, were used after the final AWE FD experimental event to confirm and verify training insights and lessons learned.

Findings:

Training lessons learned and implications were classified into nine categories. Key findings include: (a) units should first train to proficiency on combat fundamentals and then train to digital proficiency before integrating into warfighting operations; (b) identify new tasks resulting from digitization and ensure that they are incorporated into training; (c) training technologies and programs need to be explained to unit personnel when introducing them into unit training programs; (d) the level

of digital knowledge and skill is dependent on the digital system, its interface, and the operator's entry level position in the unit; (e) digital learning centers are key training environments for executing unit digital training and sustainment training; (f) simulation training can be significantly enhanced when structured training programs are applied; and (g) automation officers and support personnel are needed to support digital and network operations and digital training at the battalion level.

Utilization of Findings:

Information and findings from this report will be used in the AWE After Action Review (AAR) report published by the Mounted Battlespace Battle Lab. The AAR report documents the official findings from the AWE Focused Dispatch.

TRAINING IN A DIGITIZED BATTALION TASK FORCE: LESSONS LEARNED AND IMPLICATIONS FOR FUTURE TRAINING

CONTENTS

CONTENTS (Continued)

LIST OF TABLES

LIST OF FIGURES

Page

TRAINING IN A DIGITIZED BATTALION TASK FORCE: LESSONS LEARNED AND IMPLICATIONS FOR FUTURE TRAINING

Introduction

The research reported here supports the U.S. Army's ongoing campaigns, the Force XXI Campaign and the Training and Doctrine Command (TRADOC) Joint Venture Campaign, to redesign the operational forces, redesign the supporting institutional forces, and to develop and acquire information technologies to meet the challenges of the future (U.S. Department of the Army, 1995a). TRADOC's Battle Lab experiments, particularly Advanced Warfighting Experiments (AWEs) conducted within the last two years, are the foundation of the Joint Venture effort. Six AWEs were approved by the Chief of Staff of the Army for 1994 through 1995 for exploring and evaluating new approaches to warfighting. The present research effort was linked to one of those six efforts, AWE Focused Dispatch (FD). The AWE FD was conducted at Fort Knox starting in September 1994 with the main effort focused from January to September 1995. The AWE FD evaluated the process of organizing, training, and using digital and other technologies to enhance battlefield lethality, survivability, and tempo; three essential ingredients for successful warfighting.

The research effort described in this report is part of the Science and Technology Objective (STO) FASTTRAIN, a U.S. Army Research Institute (ARI) STO, which is designed to support Force XXI training methods and strategies (U.S. Army Research Institute for the Behavioral and Social Sciences, 1995). The FASTTRAIN research was designed to exploit the use of simulation and AWEs to demonstrate and evaluate prototype Force XXI training strategies, techniques, and performance evaluation technologies for brigade and below organizations. As a start for this new STO, a research effort was planned for extracting training lessons learned from the Mounted Battlespace Battle Lab's AWE FD.

This research was an exploratory effort for extracting lessons learned through observation of a unit's preparatory training for digital warfighting. The role of ARI during AWE FD was to unobtrusively monitor and document the AWE Task Force (TF) home-station training and capture insights from the TF participants. The specific objectives for this research effort were to: (a) document the digital training efforts of the U.S. Army Armor School (USAARMS), 16th Cavalry Regiment, TF 2d Battalion (Bn), 33d Armor (AR) (TF 2-33 AR) during the AWE FD; (b) capture the training lessons learned; and (c) examine the findings for implications for future Force XXI training methods and strategies.

Background and Review of Key Literature

Background

The U.S. Army has embarked on a journey to change today's army into a 21st Century army - Force XXI. The army of tomorrow will most likely be confronted with a wider variety of challenges and threats much different than the recent Cold War era army. Today's army must transition from a European forward-deployed army to a continental United States (CONUS)-based, power projection, multiple-contingency force. Tomorrow's force must be capable of rapidly deploying tailorable units. These units must be capable of deploying to remote environments to conduct simultaneous missions over a continuum of operations. Operations could range from operations-other-than-war (OOTW) missions to fighting a variety of enemies who may possess sophisticated weaponry and nuclear, biological, and chemical arsenals (U.S. Department of the Army, 1994a; U.S. Department of the Army, 1994b).

The transition from a Second Wave (Industrial Age) army to a Third Wave (Information Age) army (Toffler and Toffler, 1993) requires evolutionary and revolutionary ideas on how to organize, fight, and prepare (train) the force for conducting missions in the 21st century. "The central and essential feature of this army will be its ability to exploit information" (U.S. Department of the Army, 1995a, P. 6). The U.S. Army has incorporated information exploitation (information warfare) as the basis for its future operations and doctrine (U.S. Department of the Army, 1994b; U.S. Department of the Army, 1995g). General Sullivan, former Chief of Staff of the Army, indicated "Digitization - harnessing the power of information - will enable us to...create a force for the future..." (Sullivan, 1994, p. 2). To create the future force, General Sullivan envisioned a plan to "synthesize technology, doctrine, and organization into an army" (p. 3) which could fight and win the nation's wars in the 21st century.

Force XXI and Joint Venture Campaigns

Force XXI is not only an end result but is an overarching concept with definitive actions to transform today's army into the future force. The Force XXI strategic goal is to have a future force that is more lethal, survivable, capable of maintaining high tempo operations, deployable, versatile, and sustainable with increased joint and combined connectivity. The strategic objective is to transform the current Industrial Age Army to a knowledge- and capabilities-based power projection force capable of achieving land dominance across the entire spectrum of 21st Century military operations. Force XXI (and Army Modernization Program) objectives that enable the Force to fight and win on the future battlefield include (a) dominating maneuver, (b) projecting and sustaining the force, (c) conducting precision strikes, (d) winning the information war, and (e) protecting the force (U.S. Department of the Army, 1995a).

To implement the Force XXI concept and accomplish the strategic transformation to tomorrow's force, the Army has developed a campaign plan. The Force XXI Campaign Plan contains key decision points for guiding the Army in fielding Force XXI before 2010. The plan incorporates three simultaneous and complementary axes of attack (Figure 1). The first axis of main effort is the redesign of the force which is referred to as Joint Venture, a TRADOC led effort to produce the best possible operating force. The second supporting axis is the reorganization of the institutional Army and its Table of Distribution and Allowances (TDA). The third supporting axis concentrates on the development and acquisition of information-age technologies needed for information-age battle command, i.e., digital communication hardware (HW) and software (SW) (U.S. Department of the Army, 1995a; U.S. Department of the Army, 1994b).

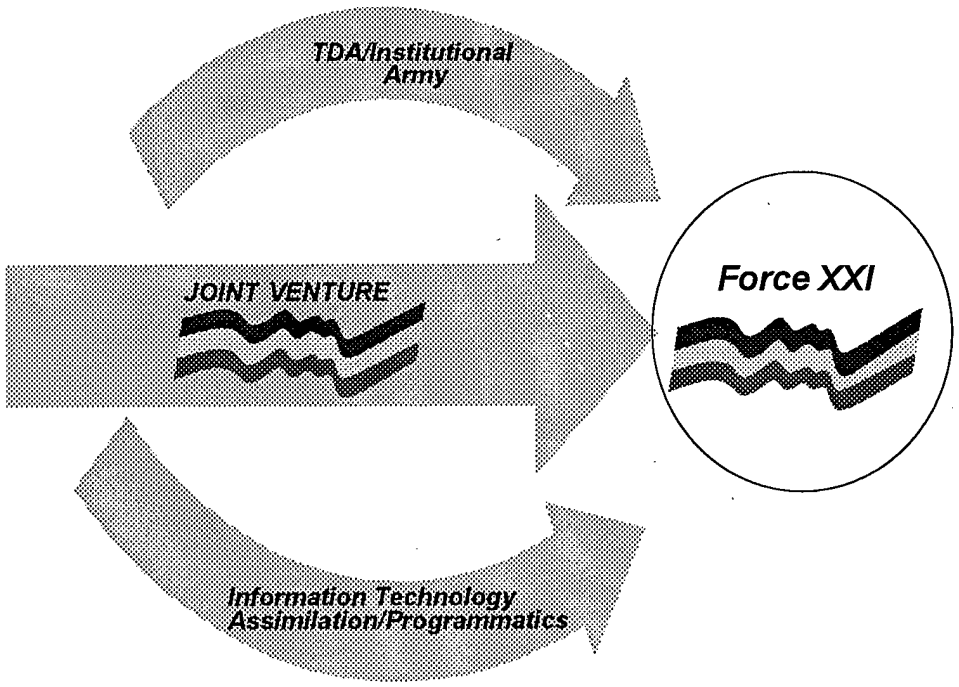

Figure 1. Force XXI Campaign (U.S. Department of the Army, 1995e).

The TRADOC Joint Venture Campaign, a major thrust of Force XXI, serves as the focus for integrating efforts in developing the basic organization and operational concept for Force XXI. The Joint Venture mission is an Army-wide effort to attain Force XXI fielding decisions by fiscal year 2000. Joint Venture will proceed using three phases to reach Force XXI fielding. Phase I, Early Experimentation, focuses on conducting experiments to assess organizational and operational (O&O) concepts, tactics, techniques, and procedures (TTPs), and enabling technologies for establishing a brigade (Bde)-level baseline (Task Force XXI).

Follow-on experimentation for division (Phase II: Force Design) and corps designs will yield the final fielding decisions for Force XXI (Phase III: Fielding and Refinement). To execute this mission in each phase, Joint Venture is using a tight iterative cycle of concept definition, requirements review, force design, equipping, training, and experimenting to address Force XXI hypotheses across doctrine, training, leader development, organization, material, and soldiers (DTLOMS) (U.S. Department of the Army, 1995e). The TRADOC Battle Labs serve as the mechanism for executing this cycle by conducting AWEs and Battle Lab Warfighting Experiments (BLWEs). The AWEs and BLWEs involve soldiers and units using tactical scenarios in live, virtual, and constructive simulation environments (U.S. Department of the Army, 1995d).

Battle Lab Experiments

Battle Lab experiments are the key to Joint Venture success. As mentioned earlier, warfighting experiments conducted within the last two years serve as a foundation for Joint Venture and provide the frame of reference for current and future AWEs. Figure 2 depicts the "experimentation pathway" that leads to fielding Force XXI. Although the long range goal is Force XXI, the more immediate objective will be using previous experimentation and lessons learned to develop TF XXI, a Bde-size experimental force (EXFOR) at Fort Hood.

As can be seen in Figure 2, many tests, demonstrations, and experiments have preceded the AWE FD. Many of the lessons learned about early digitization efforts, simulation, and field demonstrations have been adapted for the AWE FD. However, not all DTLOMS have been examined consistently and equally in previous efforts. This is especially true for training. Prior to the AWE FD, the Mounted Battlespace Battle Lab (MBBL) examined the impact of inserting information technology into a mounted armor force along with new approaches to experimentation and training. This AWE, known as Operation Desert Hammer VI, was conducted during a National Training Center (NTC) rotation. It was the first in a series of experiments measuring the impact that digital information technology would have on a mounted force. A description of Operation Desert Hammer VI follows.

Advanced Warfighting Experiment Operation Desert Hammer VI

The MBBL, in conjunction with other Department of the Army agencies, conducted an AWE in April 1994 using the TF 1-70 Armor from the 194th Separate Armored Bde as the AWE TF. The purpose of that AWE was to test the following premise: If you horizontally insert digital communication systems into an existing organization using current TTPs then there should be resulting increases in force lethality, survivability, and tempo (U.S. Department of the Army, 1995a). The experiment was designed to (a) capture the impact of digitization upon DTLOMS

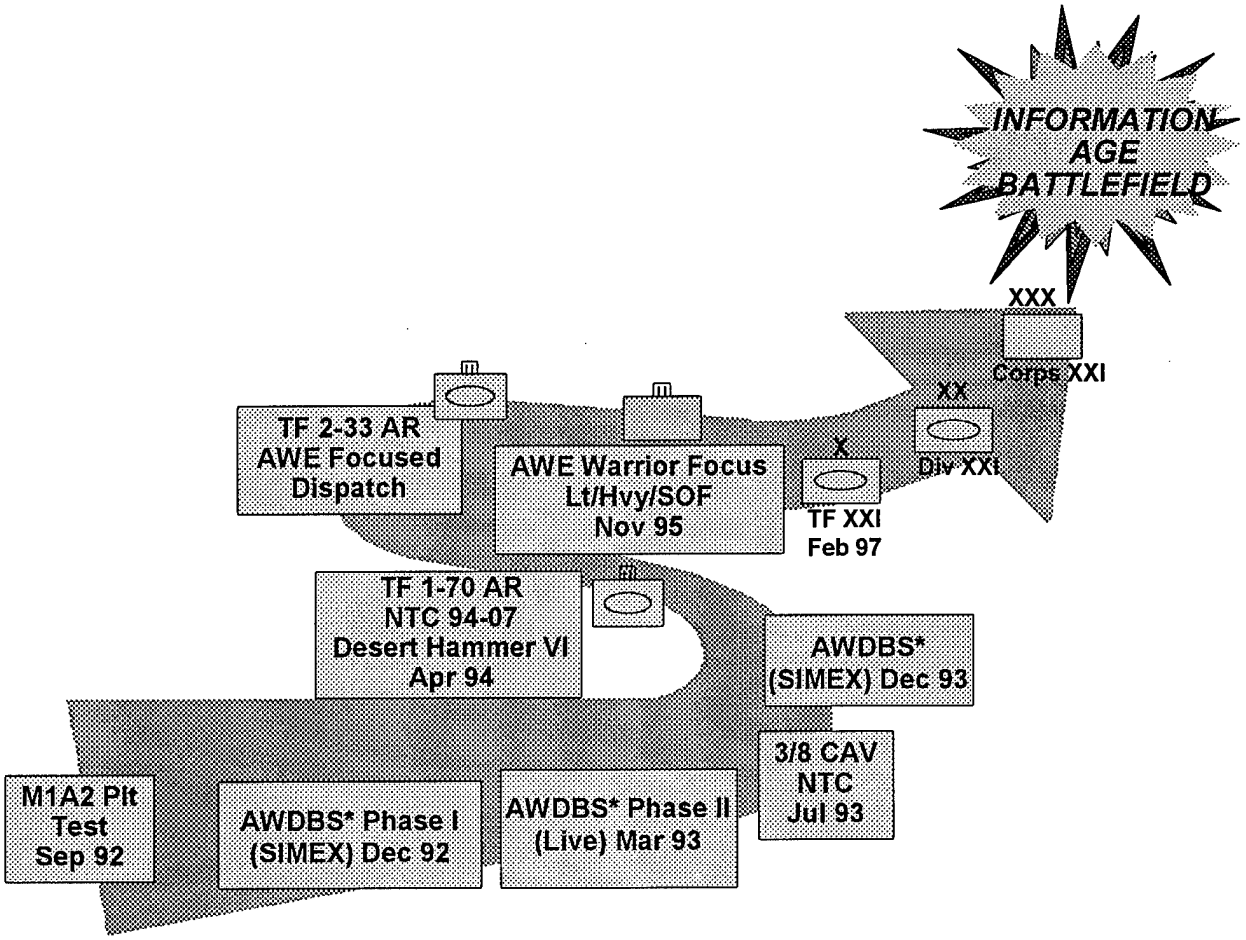

Figure 2. The "experimentation pathway" leading to fielding Force XXI (U.S. Army Armor Center, 1995b).

and (b) compare quantitative measures of performance (MOP), task performance, unit performance, mission accomplishment and training differences between the horizontally digitized Bn TF and four other rotating non-digitized Bn TF (baseline) units (U.S. Army Armor Center, 1994).

Experiment objectives were divided into primary and secondary objectives. Primary objectives were to assess the impact of horizontally integrating digitization on a TF. Primary objectives included: (a) determining the impact of the warfighting capability of a digitized TF, (b) examining the impact of digitally linking all Battlefield Operating Systems (BOS) at the TF level, (c) examining the impact of digitization on DTLOMS, and (d) determining the impact of digitization on a TF's lethality, survivability, and tempo. Secondary objectives were to identify materiel improvements and training issues. Secondary objectives included: (a) identifying SW improvements for the Intervehicular Information System (IVIS) and Bde and Below Command and Control system (B2C2), (b) capturing warfighter insights and identify improvements on all digitized and

developmental systems used, and (c) determining training insights concerning digital system training and use of virtual system training as a training tool (U.S. Army Armor Center, 1994).

Over 120 items of equipment for information age technology were used during the experiment. The partially digitized TF had several digital devices as part of the information age technologies inventory. The IVIS was available on M1A2 tanks for sending and receiving digitized reports and graphical overlays for command and control (C2) at the TF and below level. The B2C2 was available for TF and Bde C2 functions. The B2C2 was able to (a) send and receive high resolution map overlays with standardized symbology (between B2C2 systems only), (b) compose and transmit text messages, and (c) receive and plot Global Positioning System (GPS) information on the screen. The Initial Fire Support Automation System (IFSAS) was used as tactical fire control within and outside the TF. The All Source Analysis System (ASAS) was a tactically deployable intelligence and electronic warfare processing, analysis, reporting and technical control system. It was used for intelligence processing and reporting, target identification and prioritization, and intelligence collection management. Other systems were available for performing air defense warning, reconnaissance, mortar support, artillery support, and intelligence gathering functions (U.S. Army Armor Center, 1994).

The AWE TF trained at Fort Knox and on-site at the NTC in preparation for the NTC rotation. During preparatory training, leaders received the majority of training on digital systems, primarily IVIS (Kollhoff, 1995). Some B2C2 and Precision Lightweight GPS Receiver (PLGR) digital system training occurred prior to the NTC rotation (U.S. Army Armor Center, 1994). However, much of the digital systems and devices training occurred just prior to or after arrival at NTC. Additionally, the AWE TF had no TF field maneuver training within the last 12 months prior to the rotation (Kollhoff, 1995). Instead, the AWE TF unit maneuver training was accomplished primarily in virtual simulators at Fort Knox. (Most of the simulation training was conventional without digital integration.) In fact, the AWE TF only drove 316 miles and shot 2,200 tank main gun rounds compared to conventionally-equipped baseline units that averaged driving 749 miles and shooting 4,146 tank main gun rounds in preparation for their NTC rotation (Maggart, 1994).

Within NTC rotations, the AWE TF and comparably sized conventionally-equipped baseline units fought realistic Multiple Integrated Laser Engagement System (MILES) instrumented engagements against the same opposing force (OPFOR) in deliberate attack (DATK), defense in sector (DIS), movement to contact (MTC), and hasty attack (HATK) missions. Observer/controllers (O/Cs) served to assure realistic combat style engagements, refereed engagements, collected non-instrumented data, and conducted after action reviews (AARs). In addition, all units conducted a live-fire exercise (U.S. Army Armor Center, 1994).

Results indicated increases in lethality, gains in survivability, and faster tempo in the combat service support (CSS) arena for the AWE TF. Primary objectives were partially supported but were constrained by the immaturity of systems, digital interconnectivity problems, and training shortfalls. Secondary objectives were met by capturing and collecting subjective information from different players in the AWE. Comments and insights from O/Cs, subject matter experts (SMEs), and AWE participants provided information to improve and enhance specific items of equipment and digital system HW and SW components. Training insights were gathered by comparing baseline units and the AWE TF training preparation for the NTC. Training insights and conclusions were documented in the Final Report of Operation Desert Hammer VI AWE (U.S. Army Armor Center, 1994) and summarized by Kollhoff (1995). Summaries of the warfighter training insights and conclusion in the areas of training tasks, strategy, methods, evaluation, and literature are shown in Table 1. One of the most important training insights was the training strategy (hierarchy) that should be used for unit digital warfighting training. Figure 3 illustrates that a unit should first train combat fundamentals to proficiency then train digital skills to proficiency then integrate and train to achieve digital warfighting proficiency.

Table 1

Summary of Warfighter Training Insights and Conclusions From Advanced Warfighting Experiment Desert Hammer VI

Training Tasks
- Identify new, modified, and unchanged tasks.
- Integrate new/modified tasks and procedures into training.
- Train other crew members/sections on digital tasks.

Training Strategy
- Train horizontally across and vertically within Battlefield Operating Systems (BOS).
- Training events should occur at company and higher levels with key players to attain synchronization.
- Train to proficiency on combat fundamentals and digital equipment then integrate into warfighting skills.
- Use structured training with a clear progression in strategy and monitor for success.
- Integrate digital systems with combat fundamentals.
- Orient to complete Combined Arms (CA) training with a higher percent of CA exercises.
- Develop virtual simulation training programs.
- Allot time for leaders and soldiers to train on digital systems until they are second nature and to gain insights into best use of the systems.

(Table Continues)

Training Methods
- Use embedded training (tutorial SW within system) to maximize use of available training time.
- Have a "master digitizer" at company/team level to train.
- Use simulations to increase unit training opportunities for larger units, i.e., battalion and higher.
- Train how and when to use digital versus voice.
- Integrate digital systems into unit warfighting procedures.
- Use hands-on training to achieve proficiency.

Training Evaluation
- Evaluation should be continuous, at all echelons, and integral to all training events.
- Use external evaluations, digital skills tests, and "gates" in simulation to ensure units are proficient.

Training Literature
- Develop new training literature across the board and update tasks, conditions, and standards.
- Develop and validate new TTPs.

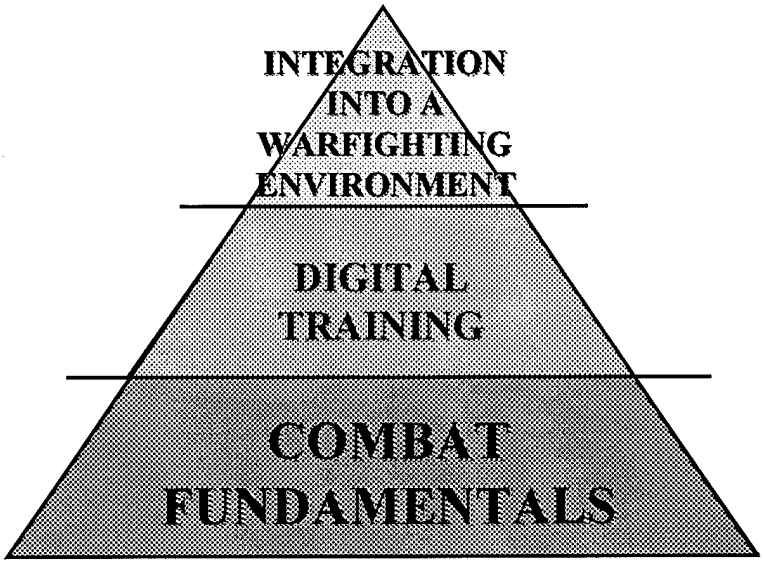

Figure 3. Adapted training hierarchy for achieving digital warfighting capability (U.S. Army Armor Center, 1994).

The AWE Operation Desert Hammer VI was considered a success. The AWE demonstrated that digital systems have the capability to: (a) improve lethality and survivability, (b) provide more

accurate and responsive intelligence, (c) make for a smoother handoff to joint systems, (d) and provide faster observer-to-shooter timelines despite use of many prototype systems and immature training developments (Sullivan, 1994). In addition, this AWE confirmed the experimentation approach and established the comparative baseline for all future mounted force warfighting experiments (U.S. Army Armor Center, 1995a). Although this AWE identified numerous global training insights, specific challenges and solutions to training a digitized mounted force remained.

In October 1994 the Chief of Staff of the Army approved the concept for AWE FD. His instructions were that it should be (a) a follow-on exercise to AWE Desert Hammer VI, (b) be smaller in scale, (c) be executed at a home-station training site, and (d) be structured to emphasize training development and small unit effectiveness insights (U.S. Army Armor Center, 1995a, p. 1).

Advanced Warfighting Experiment Focused Dispatch

Overview

The AWE FD was not a repeat of Desert Hammer VI but a new approach for MBBL experiments. Previously, "experiments" were geared more toward demonstrations of technology and its impact on warfighting. Unlike before, this AWE consisted of a series of focused sub-experiments in constructive, virtual, and live simulation environments. The sub-experiments were designed to validate existing doctrine or serve as a mechanism for developing digitized doctrine and TTPs if no validation was achieved. Also, the sub-experiments were to serve as a means for developing digitized training support packages and warfighter insights into small unit effectiveness (U.S. Army Armor Center, 1995a). Virtual and constructive experiments were performed in the Mounted Warfare Test Bed (MWTB) and Janus facilities, respectively, at Fort Knox. The culminating Live-Virtual simulation experiment was conducted at the Western Kentucky Training Area (WKTA) in Greenville, KY, with virtual simulation linkage to Bn TF elements in the MWTB.

Experiment Issues and Central Hypothesis

The series of sub-experiments were designed to examine organization, doctrine and TTP changes that optimize digital systems, information interconnectivity, and communications. Focusing on particular system issues of the Battlefield Operating System (BOS) (i.e., Fire Support, Intelligence, Combat Service Support, and Battle Command), the AWE was intended to gather insights into training, operations, and how future forces might conduct warfighting (U.S. Army Armor Center, 1995a). The central hypothesis throughout the four BOS systems and combined arms research objectives was "If procedural, functional, and organizational changes in fires, intelligence, logistics, and battle command are implemented as a result of digital

connectivity, then even greater enhancements in lethality, survivability, and tempo will result" (p. 10).

The AWE FD objectives were organized into central issues reflected in the following questions (U.S. Army Armor Center, 1995a, p. 10):

1. What doctrinal changes (i.e., TTPs) need to be made as a result of digitized information?

2. What current processes and functions can be eliminated or streamlined as a result of digitization?

3. What are the training requirements for a digitized Bn TF (by echelon)?

4. Is there an optimal level of digitized information the commander/leader needs to make decisions?

5. What materiel changes are needed (a) as a result of digitization and (b) to make the flow of information more efficient and effective?

Based on answering these questions, certain deliverables were to be handed off to TRADOC Headquarters (HQ) for future experimentation in TF XXI experiments. Deliverables included: (a) doctrine and TTPs for the Mounted TFs of TF XXI; (b) training support packages for digitized operations; (c) insights and recommendations for TF XXI organizational experimentation; (d) refined digital information requirements; and (e) insights across DTLOMS (p. 2).

Methodology

The AWE FD was not about comparing the effectiveness of a digitized TF against non-digitized TFs. Instead, AWE FD was about refining digital doctrine and TTPs and capturing insights for future experimentation in the mounted "battlespace dynamic" (U.S. Department of the Army, 1994a). There was no formal or baseline control case as typified in most experiments. Instead, there was a digitally-equipped J-series Bn TF organization (U.S. Department of the Army, 1988) in which TTPs were to be verified and refined. Experimental excursions were used to explore "what if" changes in the digitized organization procedures and processes to gather insights into improving information availability and flow within the TF. Each time improvements were noted, the improvements were incorporated into the next iteration of sub-experiment resulting in a new experimental baseline case. This was known as the spiral development process and rolling baseline methodology (Figure 4) and was to be used throughout the AWE across and within all three simulation environments.

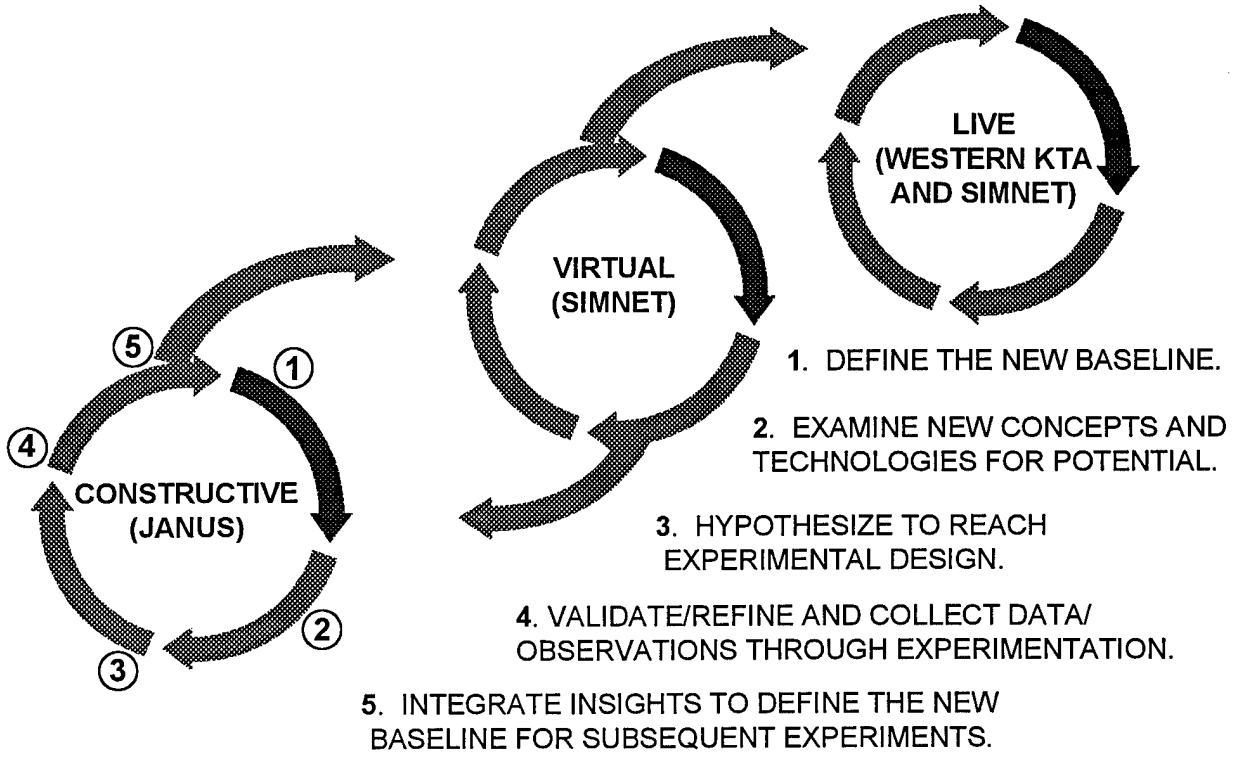

Figure 4. The spiral development process and rolling baseline methodology (U.S. Army Armor Center, 1995b).

Data Collection Events

Throughout the AWE there were sub-experiments conducted within each simulation environment. Figure 5 provides an overall view and relative order of experiment data collection events.

As pictured, Janus 1 (conducted in September through October 1994) was a constructive simulation exercise focused on collecting comparison data and evaluating resulting changes to processes, functions and organizations as a result of digitization. Virtual Simulation 1 (VS1) was conducted in April 1995 in the MWTB. In this event the TF commander (Cdr), staff, TF slice elements, and company (Co) Cdrs fought DIS and MTC missions on an NTC terrain database while equipped as a digitized TF. Janus II, another constructive simulation experiment, was conducted during March 1995 in a Janus facility in the Directorate of Combat Development (DCD) to refine field artillery call for fire TTPs. The Janus III Command Post Exercise (CPX) was conducted from May to June 1995 in the Janus training facility at Fort Knox. The digitized TF performed DIS, MTC, and DA missions on the WKTA terrain database while data collection efforts focused on intelligence and battle staff functions. Virtual Simulation II (VS II), scheduled to occur in June to July 1995 (but cancelled), was to be a precursor to the Live-Virtual experiment. The emphasis was on conducting "full leader" (down

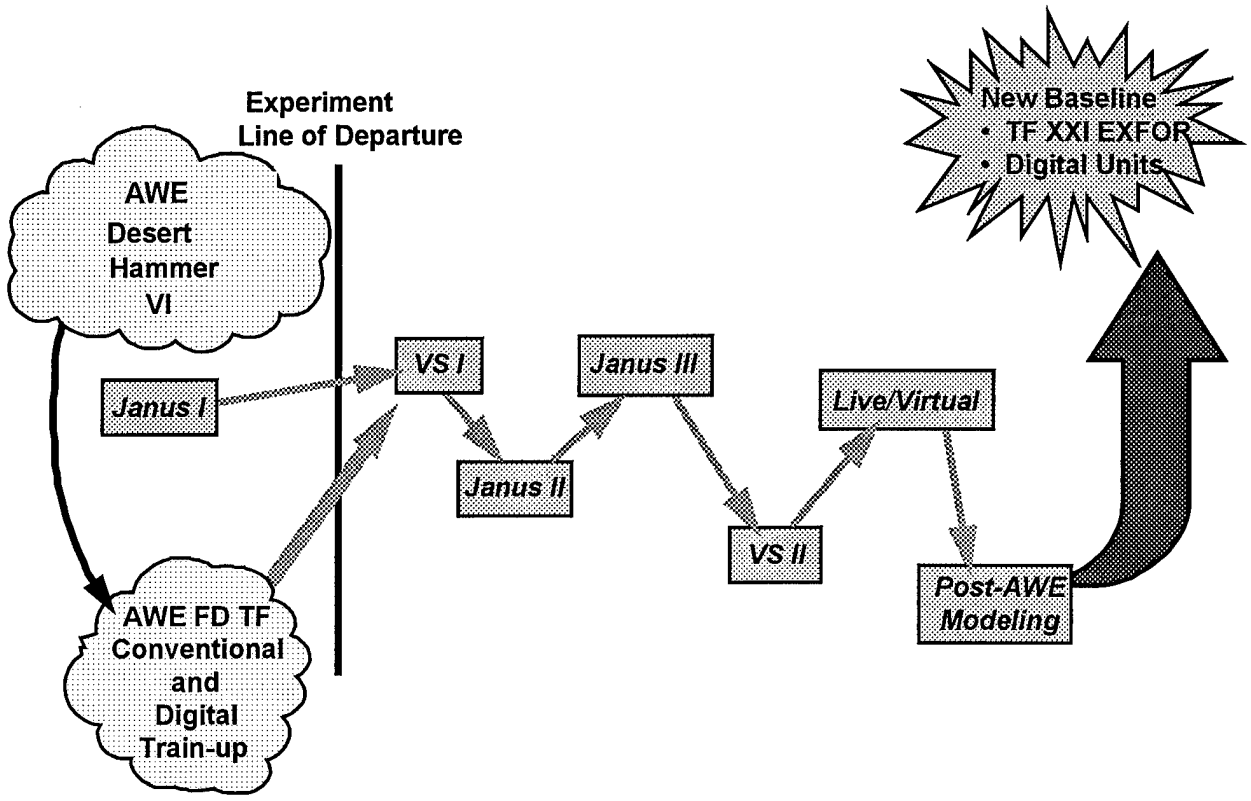

Figure 5. Advanced Warfighting Experiment Focused Dispatch constructive, virtual, and live data collection events (U.S. Army Armor Center, 1995b).

to platoon (Plt) sergeant (SGT) level) digitized TF exercises in both the MWTB and the Mounted Warfighting Simulation Training Center (MWSTC) virtual simulation facilities. The Live-Virtual experiment was conducted from August to September 1995 at the WKTA in Greenville, KY. For this final event, a digitized TF slice (i.e., C2 elements, one Co Team (Co/Tm), Bde control cell, and TF slice), remaining TF elements, and selected BOS elements were virtually linked at the MWTB and internet nodes at home station, respectively. Live and virtual TF elements fought live and virtual semi-automated OPFOR in DIS, MTC, and DATK missions. Data and insights were gathered to feed post AWE FD modeling efforts. The lessons learned from these efforts will be used in the next AWE, the Bde-level AWE TF XXI planned to occur at the NTC with a Fort Hood-based unit.

In summary, there were many issues to be examined within the context of the AWE FD. A major goal was to document the improvements to the digital information process and flow and to materiel that would impact the information capabilities of a future digitized mounted force. One foundation that dramatically affected the successful achievement of that goal was the preparation of the TF to operate the digital equipment

individually and collectively to enhance the mounted warfighting process. Training was critical, as it was in AWE Desert Hammer VI, for the successful conduct of this AWE and will be for future efforts to accomplish Force XXI goals. Thus, it was critical to document and capture training process data and any crucial insights appropriate for future Force XXI training efforts.

Research Objectives

In the AWE Desert Hammer VI, TF training was documented after home-station training had occurred. Although many useful insights came out of the training data collection and summarization effort, direct observation of the training process may have added specificity to the insights. With this in mind, this research effort was instituted to capture training data through direct observation and indirect methods to document the TF train-up for the Live-Virtual sub-experiment of AWE FD. Through this data capturing process and resultant data, training lessons learned about information age impacts on the mounted armor force could be derived to assist near term TF XXI efforts. In addition, many of the derived training lessons learned could be examined for application to future Force XXI training strategies and methods. Thus, the research objectives were to (a) document the TF digital training preparation during the AWE FD, (b) derive training lessons learned, and (c) examine the implications the lessons learned may have for future Force XXI training strategies and methods.

The following sections of this report describe the TF organization and participants, equipment and digital connectivity, research approach, and TF training including training facilities and the training that occurred from January to August 1995. Subsequent sections address the insights and lessons learned as well as the implications for future training strategies and methods. An acronym list is provided at Appendix A and data collection instruments (including questionnaires and interview sheets) are included in Appendix B.

Task Force Organization and Participants

This section describes the objective TF structure as used in the AWE FD Live-Virtual experiment. This section also provides a brief description of the participant sample including their prior military, computer, and simulation experience.

Task Force Organization

The objective AWE FD TF was composed of TF 2-33 AR organization slices and attached elements from other organizations. Throughout home-station training, the TF had varying slices of combined arms elements available during training events but never the full objective force structure intended for the Live-Virtual experiment.

As seen in Figure 6, the 16th Armored Cavalry Regiment served as the Bde in operational control of (a) a virtually simulated aviation Bn from Fort Rucker, Alabama, (b) the C2 for the TF, (c) coordinating the TF indirect fires from the live artillery battery, and (d) coordinating the flow of external intelligence information from the live military intelligence (MI) Co.

The TF 2-33 AR live simulation assets included: (a) an armor HQ and HQ Co (HHC) which provided Bn support with mortar, scout, medical, armor maintenance, and signal/communications Plts; (b) a tank Co/Tm (B Co/Tm) with two M1A2 tank Plts; (c) a M2A2+ Plt; (d) an Engineer Plt (for mobility and countermobility operations); and (e) a Fire Support Team (FIST) for indirect fire control operations.

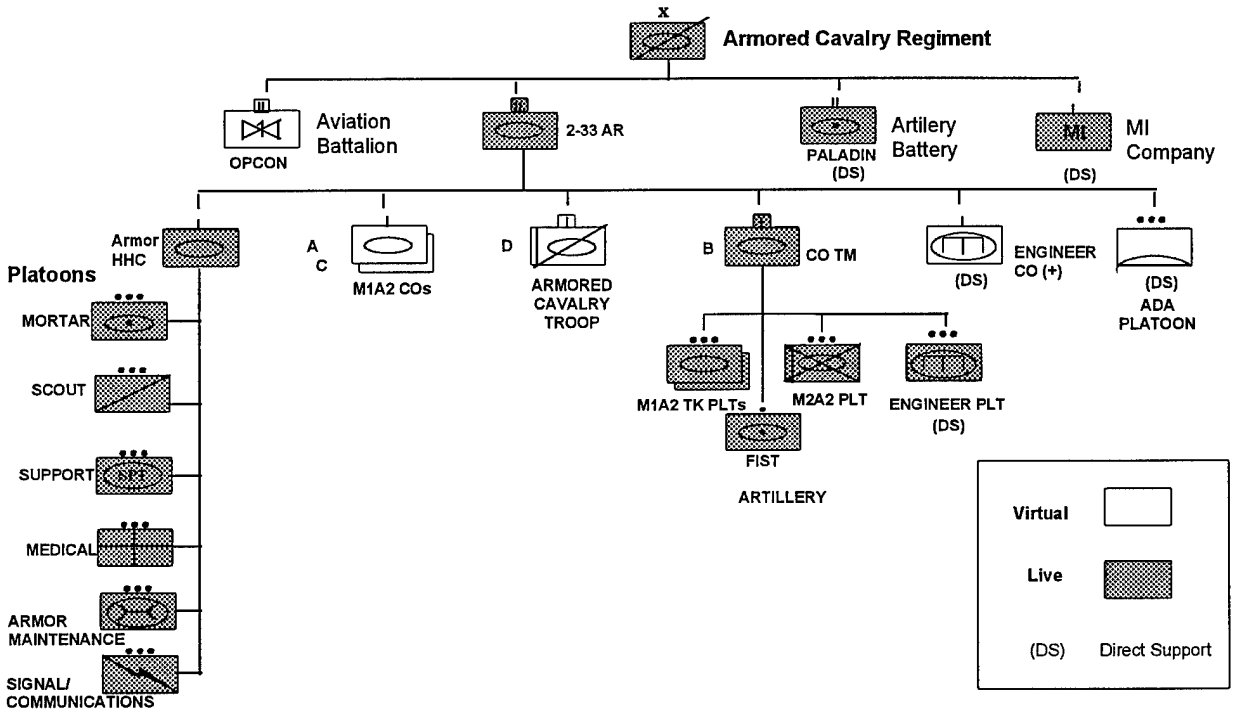

Figure 6. Battalion task force structure in the live-virtual experiment (adapted from U.S. Army Armor Center, 1995c).

The TF 2-33 AR virtual simulation assets included: (a) two Co Cdrs (A and C Cos), (b) a mechanized infantry Co/Tm Cdr (D Troop), (c) First Sergeants (1SGs) who controlled the Co CSS functions, (d) Fire Integration Support teams (FISTs) who handled Co call for fire requests, (e) an Engineer Co (filling in with the rest of the Bn assets that B Co/Tm possessed) that emplaced minefields and sensors on virtual terrain, and (f) an air defense artillery (ADA) Plt which provided air defense for the Bn. The ADA Plt had Bradley Stinger Fighting Vehicle (BSFV) simulators

and personnel located at Fort Bliss, Texas. Their Plt leader (PL) was located at the MWTB in a BSFV-enhanced simulator for coordination with the Bn TF.

Participant Sample

Since the focus of this report was centered on TF home-station training, no assets external to the TF were considered for data collection. Prior to the TF's departure for the Live-Virtual experiment, primary digital system operators were identified and requested from the TF 2-33 AR organization for follow-on data collection. Upon return to home station, not all primary operators were available for the data collection phase, i.e., Co executive officers (XOs), B Co/Tm PLs, 1SGs, and S1 and S4 non-commissioned officers (NCOs). However, the sample of officers represents the primary digital operators that participated in the home-station training and AWE FD experiments. The sample consists of the following personnel: (a) TF Cdr, (b) XO (Deputy TF Commander and Chief of Staff), (c) S1 (Personnel Officer), (d) S2 (Intelligence Officer), (e) Battlefield Intelligence Collection Cell (BICC) assistant, (f) S3 (Operations Officer), (g) S3 Air (Battle Captain), (h) S4 (Logisitcs Officer), (i) Co Cdrs, (j) HHC Cdr, (k) Mortar PL, (l) Medical PL, (m) Scout PL, and (n) Chemical Officer. (Appendix C contains a demographic description of the sample of participants.)

Military experience

The sample consisted of 17 officers including one lieutenant colonel, two majors, seven captains, and seven lieutenants. Twelve officers were armor branch qualified. Average time in military service was almost 8 years with the senior officer having served 19 years, 9 months and the most junior officer having served 2 years, 3 months. Of 16 responding, all had prior experience in Table of Organization and Equipment (TO&E) units and 11 respondents reported having participated at the NTC or Combat Maneuver Training Center (CMTC) with a participating unit. All had reported to TF 2-33 AR by January 1995, prior to the start of home-station training.

Prior computer experience

All officers in the sample report having had prior computer experience. Fifteen reported having had more than one year of computer experience and all responded that they felt comfortable using computers. All reported having had prior experience with a Windows-type interface. Six of the officers reported having had previous experience with the digital equipment used in AWE FD.

Prior simulation experience

For virtual training simulation (i.e., Simulation Network (SIMNET)), 9 of 17 respondents reported having over 24 hours experience in SIMNET while four reported having no experience.

Of 17 respondents, eight reported participating in equipment evaluations in virtual simulation (i.e., SIMNET-developmental (SIMNET-D) or MWTB). Twelve of the sample had participated in at least one Janus exercise, a constructive simulation.

Digital Equipment

There were many technologies evaluated in the AWE FD but the primary focus was on digital equipment technology at the TF level and the TTPs involved in using that equipment. Primary digital equipment was located in the M1A2 tanks, Bradley Fighting Vehicles (BFVs), mobile tactical operating center (TOC), Command and Control Vehicle (C2V), Combat Trains Command Post (CTCP), and the Battle Command Vehicle (BCV) M1A1 tank and M2A2 BFV variant. Primary digital equipment included the B2C2 system, IVIS, ASAS workstation (WS), and IFSAS. All primary digital systems used the Integrated Communication (ICOM) Single Channel Ground Air Radio System (SINCGARS) as the radio link for transmitting data. In addition, FM voice communications on Bn and Bde nets were transmitted over SINCGARS (with voice transmissions overriding digital data transmissions). A CSS system for tracking the emitted location of selected Bn CSS assets, the Movement Tracking System (MTS), was used in the CTCP. Figure 7 identifies the digital systems and their operators with the TF's primary C2 vehicles.

The IVIS was either embedded in the M1A2 tanks and BFVs or was capable of being detached for stand-alone operations, i.e., the TF Cdr's BCV. The IVIS was used within the Bn TF as a C2 system to collect, manipulate, and disseminate tactical information via preformatted text message reports and graphic overlays. The IVIS was used as an asset to monitor the close battle, track the battle plan, and advise the TF Cdr of the current ground situation.

The B2C2 SW was housed in a lightweight computer unit (LCU), a hard shell computer case for rugged field use. The B2C2 was used by the Bn TF as a system for collecting, manipulating, and disseminating C2, tactical, and logistics information within the Bn TF and to Bde. Information was relayed via combat tactical message reports, free text, and graphic overlays. The B2C2 was an asset for monitoring the Bde and Bn close battle, track the battle plan, and advise the TF Cdr of the current ground situation.

The ASAS SW was installed and operated from a Sun SPARC WS and a separate large display monitor. The ASAS was used by the Bn TF intelligence personnel, i.e., the S2 and BICC. The S2 and BICC used the ASAS to communicate with each other and Bde intelligence cell, to monitor the enemy situation, to advise the Bn TF Cdr of the enemy situation, to update the XO on the enemy situation, and direct intelligence collection efforts. The ASAS was not capable of digitally communicating with other C2 digital systems.

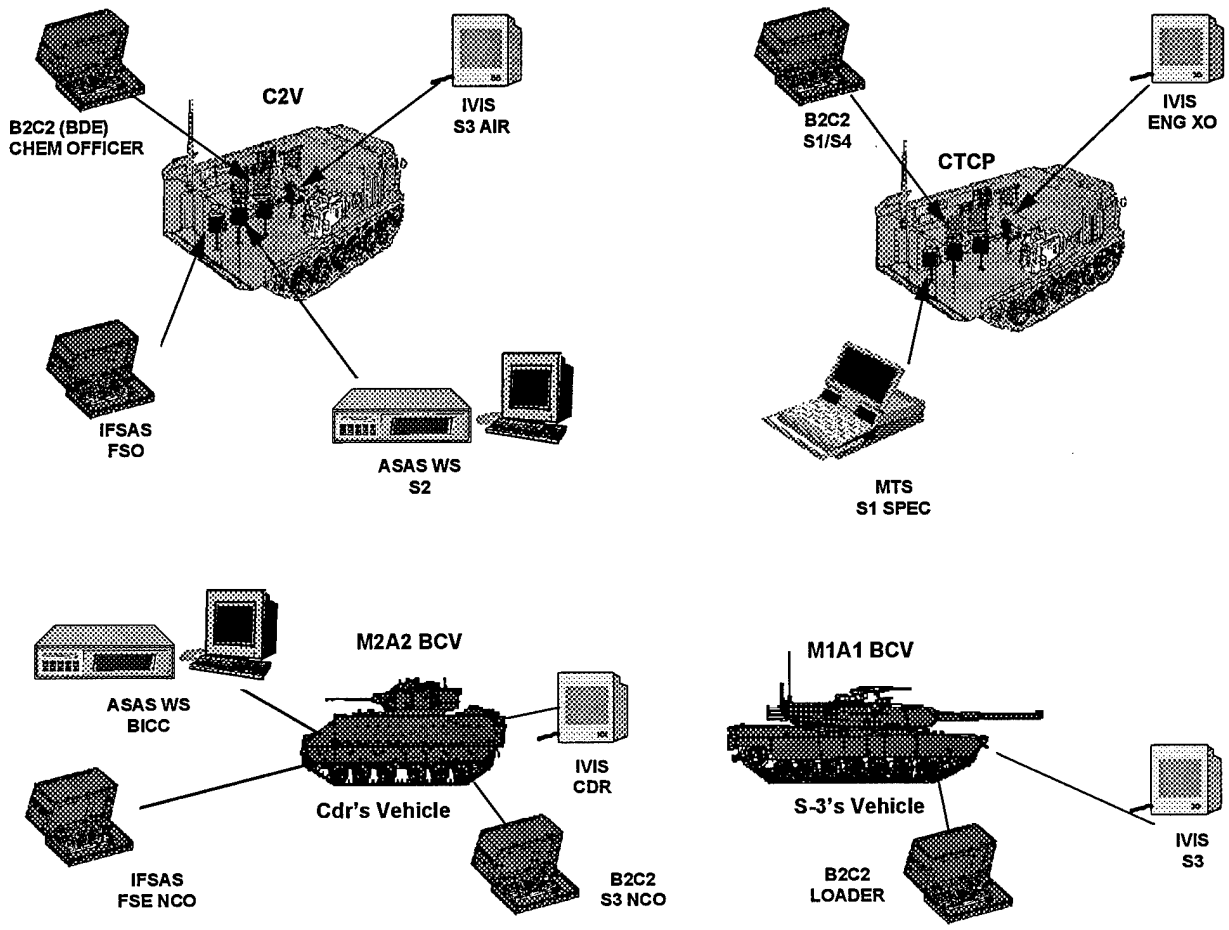

Figure 7. Primary digital communications systems, operators, and battalion task force command and control vehicles (adapted from U.S. Army Armor Center, 1995c).

The IFSAS SW was housed in an LCU like the B2C2. The IFSAS was used to automate the Bn TF indirect fire direction functions, disseminate the TF Cdr's indirect fire targeting priorities, and advise the TF Cdr on fire support matters and current ground situation. The IFSAS had a limited communication link with IVIS and was used for processing Bn TF Call for Fire (CFF) planning and execution.

The MTS was a Windows SW application system loaded on a IBM personal computer (PC) portable notebook computer (80486 processor) with connections to Global Positioning System (GPS) HW. Although not a primary system, MTS was used by CSS elements for performing logistics operations in support of the battle. (Functional descriptions of each of the primary C2 systems (i.e., IVIS, B2C2, ASAS, and IFSAS) are included in Appendix D.)

Task Force Connectivity

Figure 8 depicts the internal TF digital system interconnectivity. The FM voice communications nets within the TF are not depicted for simplicity of diagramming the digital system connectivity. Also, unseen are the FM voice connections to the Bde.

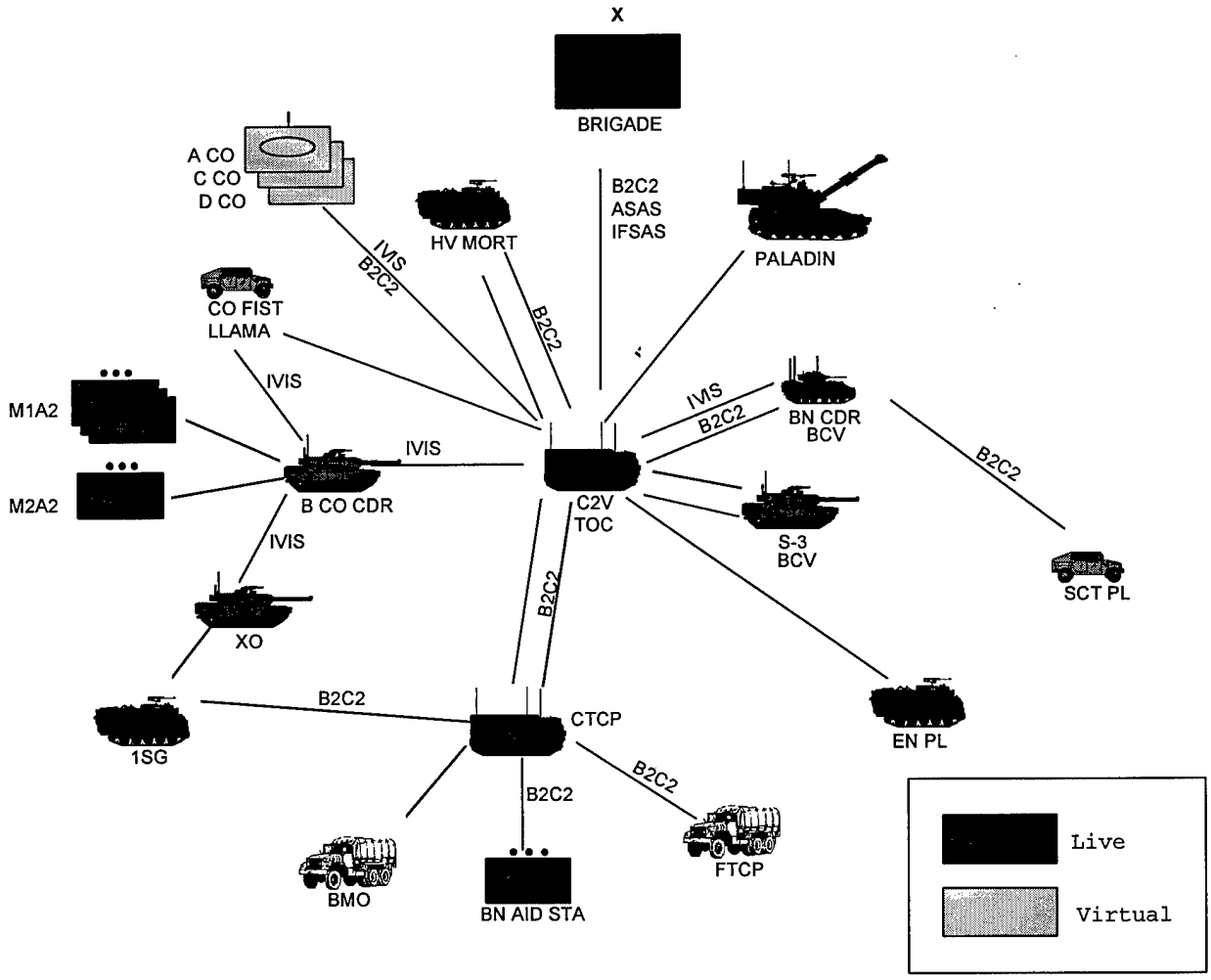

Figure 8. Battalion task force digital system interconnectivity.

The C2V and Cdr's BCV could communicate with the Bde through the B2C2 and voice on the Bde command net, ASAS and voice on the Bde operations and intelligence (O&I) net, and IFSAS on the Bde fire support net. The S3's BCV used the B2C2 and voice on the Bde command net and the S4 in the CTCP could communicate with Bde on the Bde administrative and logistics (A&L) net.

Communications within the TF was through a wider variety of nets. The C2V communications within the TF was through: B2C2,

IVIS, and voice on the TF command net, ASAS and voice on TF O&I, and IFSAS and IVIS on the Tactical Fire Direction System (TACFIRE) net. The S3's BCV could use IVIS and voice on the TF command net, and voice on the TF O&I net. In the CTCP, the S1 used a B2C2, IVIS, and voice communications on the TF command net. The S4 used the B2C2 for communications on the A&L net to CSS elements, i.e., Co 1SGs, Bn maintenance officer (BMO), the medics in the Bn aid station, and personnel in the field trains command post (FTCP). The Co Cdr communicated with the TF and higher and subordinate elements (i.e., Co FIST) via IVIS and voice on the TF command net. The Co Cdr used the Co command net to communicate directly with his elements (i.e., XO and PLs). Indirect fire support was through IFSAS on TACFIRE to the Mortar Plt and Paladin artillery. Also, B2C2 was used on the TF command net to talk with the Mortar Plt SGT (PSG) and the scout PSG. The scout Plt and the Engineer Plt were able to use the B2C2 and voice communications on the TF command net.

Research Approach

Previous efforts in the collection of training information in AWE Operation Desert Hammer VI were summative in nature and focused on after-the-fact occurrence of most home-station training events. Questionnaires were administered and interviews were conducted after training had occurred or during and after the NTC rotation. The role for ARI in AWE FD was to use a formative and summative approach to collecting training information. That is, monitor and observe scheduled events in process to document the TF home-station training and subsequently capture training participant information in order to verify insights and lessons learned. This approach afforded ARI members the opportunity to directly (or indirectly) monitor events using informal structured guidelines and to be on-site for immediate follow-up questions to clarify what occurred during the training event. Additionally, summative follow-up questionnaires and interviews could be geared toward confirming observed information and specifically tailored to ask detailed questions about the soldiers' perceptions of training and lessons learned.

The following methods for collecting, recording, and storing training data and information were used.

Observation Method

Generally, collection of observation data was loosely organized around the guidelines and procedures used in training program evaluations (Witmer, 1981; Kristiansen and Witmer, 1981). Although this was not a training evaluation, the criteria for conducting structured observations and collection of training information was useful for organizing observations of training events. Structured training criteria used for organizing descriptions of the training events included (a) the training equipment and materials, (b) training objectives, (c) factors in the training environment that could influence conducted training,

(d) training process and procedure information, and (e) any training evaluation events.

Procedurally, unobtrusive monitoring was the primary means for conducting observations during the training events. Most digital equipment training (including classroom and constructive simulation events) could be monitored from positions in which observers were behind participants with over-the-shoulder views. However, monitoring of live and virtual simulations were restricted to more indirect monitoring. Any TF live training events conducted at training areas were not directly observable and were limited to gathering training information after the event via face-to-face interviews and in AARs. Training information collection in virtual simulation collective training events was limited to monitoring events at experiment facilitator (EXFAC) WSs by watching (a) TF maneuver via digital display monitors, (b) digital transmissions on digital equipment, (c) Tactical Operations Center (TOC) actions via television monitors, (d) simulated FM radio transmissions over Citizen's Band (CB) radios, and (e) attending AARs.

Training observations were recorded as notes then transcribed as either memoranda or electronic mail. Paper copies were filed according to training event. Electronic files were organized and maintained in group and individual files for later retrieval.

Questionnaire Method

Questionnaires were developed to collect participant demographic information and training information. (Demographic and training questionnaires are located in Appendix B). Demographic questionnaires were designed to gather the following participant background information: (a) prior years of military service, specialty area, and functional area experience; (b) prior experience in various military unit positions; (c) prior simulation experience; and (d) prior computer experience. The training questionnaire was developed to gather participant perceptions of equipment training, individual training, small group training, and collective training events. The equipment training portion of the questionnaire was organized around equipment training criteria used in computer interface surveys (Shneiderman, 1992). The training event questions were selected training program evaluation criteria (Witmer, 1981) and training principles and criteria from FM 25-101, Battle Focused Training (U.S. Department of the Army, 1990a) modified as appropriate for each training event.

Questionnaire administration was conducted with a group of key officer-level primary digital equipment operators and supporters in a conference room setting. Selected key officers included: (a) Bn Cdr, (b) Bn XO, (c) Bn Personnel Officer (S1), (d) Bn Intelligence Officer (S2), (e) S2 assistant, (f) Bn Operations Officer (S3), (g) Bn Battle Captain (S3 Air), (h)

Logistics Officer (S4), (i) four line Co Cdrs, (j) HHC Cdr, (k) Fire Support Officer (FSO), (l) Mortar PL, (m) Medical PL, and (n) Chemical Officer. The TF Cdr, S3 Air, and Chemical Officer were not present for the questionnaire administration session. These participants completed their questionnaires and statements off-site. For the large group session, a privacy act and release form was read to soldiers prior to them signing the release and completing questionnaires. The demographic questionnaire was administered prior to the training questionnaire. Questionnaire administration lasted approximately 45 minutes followed by a short break.

Participant rating scale responses from questionnaires were coded and entered into statistical database files using the Statistical Package for Social Sciences (SPSS) for Windows (SPSS,Inc., 1995) for later recall and descriptive analysis. Questionnaire comments were organized into word processing files for retrieval and analysis.

Interview Method

Interview questions were developed to gather collective participant perceptions about the TF training, lessons learned, and applications to future digital training efforts. Questions were specifically designed to capture the following information from participants: (a) unobserved training that occurred after home-station training (i.e., training at the WKTA prior to the Live-Virtual phase of the experiment); (b) prerequisite digital knowledge and skill requirements; (c) sustainment training; (d) individual and collective training delivery methods, techniques, and technologies; (e) training lessons learned; (f) distractions during training; and (g) recommendations for future digital training efforts. (The interview question format is located in Appendix B).

For the one large group interview session, the interview was conducted after questionnaires had been completed and participants had returned from a short break. For individuals, interview sessions were scheduled after they had completed their questionnaires off-site. All interview sessions were taped with an audio cassette recorder for review purposes. Interview sessions averaged 2 1/2 hours.

An electronic whiteboard was used to capture and generate a paper copy of AAR-type notes during the large group interview session. Interview session notes were transcribed into word processing files and organized by questions asked. The notes were examined, organized, and condensed for addressing findings about training events, lessons learned, and implications for future training.

Battalion Task Force Training

This section describes the major training events and experiences prior to starting the Live-Virtual experiment. Although Co-level and below training occurred, the primary focus was on digital equipment training events, Bn-level individual and collective training events, and AWE FD collective events (AWE sub-experiments) that were considered major training events for the TF. The following sections include the training facilities, TF training strategy, timeline schedule of training events, and descriptions of the training events.

Training Facilities

There were four primary training facilities the TF had the opportunity to use during home-station training: (a) a TF Digital Learning Center, (b) the MWSTC, (c) the MWTB, and (d) a Janus training facility. Each facility had unique capabilities and characteristics that were used throughout the home-station training. A description of each facility and its capabilities are described below.

TF Digital Learning Center (DLC)

The DLC was designed and developed by the TF 2-33 AR and started operations on March 8, 1995. This facility was designed to provide the Bn training manager a dedicated asset to train and sustain Bn digital training efforts. Digital training efforts included integrating digital warfighting doctrine and TTPs with the training of Bn-and-below C2 systems and supporting digital systems. The DLC was situated in a classroom in Orsbon Hall (Building 1479) at Fort Knox, KY. The TF personnel built a divided learning center with one side containing standard classroom equipment (i.e., student desks, chairs, tables, portable chalkboard, etc.) which served as a room for conducting presentations and briefings. The other side contained hand-built WS tables for housing computer WSs and actual digital equipment. This side served as the "hands-on" learning environment for digital equipment and processes.

The key advantage for the TF was the flexible capability the DLC provided for individual, team, and collective training. Assets located in the center included computers (i.e., portable PCs and Sun SPARC WSs) that could be operated with a variety of SW to train individuals in digital operator skills. Also, these assets provided the capability to perform integrated collective slice training for the unit. Software assets included: (a) PC IVIS emulation SW (version 1.9) for training basic (and less capable) IVIS operations such as log on/off, reporting, and graphic overlay functions; (b) SINCGARS trainer PC SW for training individuals to properly operate the SINCGARS radio; and (c) IVIS Intelligent Computer Aided Trainer (IVIS-ICAT) SW (National Aeronautics and Space Administration, 1995) running on a Sun SPARC WS. The IVIS-ICAT served as an individual training

system (a stand-alone IVIS tutorial system). Additionally, the IVIS-ICAT served as a collective training aid possessing the capability for simulating IVIS network operations for a team (i.e., S2/S3 shop) or Bn slice (i.e., Co Cdr with PLs).

Other digital training assets located in the DLC included the primary digital systems used by the majority of the TF personnel. These assets enabled personnel to perform individual and collective training on actual digital systems they used in field training and the AWE experiments. These systems were the IVIS, B2C2, ASAS WS, and the IFSAS. To allow the digital systems to run independent of vehicles, a C2 base station with radio transmission capability was added. The digital systems with the base station allowed the TF to conduct team (i.e., staff personnel) and slice collective training. For example, digital systems were arrayed in configurations similar to what was required for the C2V so staff could train as they would fight in a C2V. The staff could practice tasks with realistic scenarios and conduct a digital orders process during (a) a communication exercise (COMMEX), (b) a CPX, or (c) a limited field training exercise (FTX) with slice elements (i.e., B Co/Tm M1A2s, M2A2+s, and other vehicles equipped with the same digital equipment) located in a nearby motor pool or local training area.

Although the DLC was extremely flexible in the kinds of training capability offered, it was limited by resource constraints and other training detractors including: (a) not enough digital assets for proper BOS or combined arms slice training, (b) support for SW updates and equipment maintenance, (c) unavailability (due to contracting money or unit turbulence) of digital system experts, and (d) line-of sight and distance limitations for digital transmissions. However, the DLC training capability provided a unique capability for initial and sustainment of individual to collective training needed for total TF digital proficiency. Additional detail and descriptions of DLC training are provided in TF 2-33 AR's Digital Learning Center Microstrategies (U.S. Army Armor School, 1995d).

Mounted Warfighting Simulation Training Center

The Fort Knox MWSTC uses SIMNET technology to link combat vehicle simulators together to support tactical training for armor and mechanized infantry units. The MWSTC is a part-task training facility that supports leader, Cdr, and staff training in command, control, and tactical maneuver of Plt, Co/Tm, and TF levels in a virtual battlefield environment. This SIMNET facility simulates many, but not all the real-world combat, combat support (CS), and CSS systems.

The MWSTC facility contains combat vehicle simulators representing the M1 Abrams tank, the M2 BFV, and the M3 Cavalry Fighting Vehicle (CFV). All simulators contain crew stations modelled after their real world counterparts. Most controls, switches, and displays present in the actual vehicles are

represented in the simulators, but only those necessary for operating the vehicle realistically within the simulation are functional. Intercom and radio systems provide communications within and between simulators, respectively. The simulated vehicles operate under constraints similar to those affecting the represented vehicles, i.e., run out of fuel or ammunition or suffer mechanical breakdowns. Weapons systems and effects are simulated so that vehicles can kill or be killed.

Crew members see and hear computer-generated imagery and sounds that provide the illusion of operating vehicles over real terrain. Virtual images of simulated vehicles are depicted on the SIMNET battleground and crew members can see the vehicles through vision blocks and sights. The virtual terrain includes man-made and natural features although somewhat unrealistically smooth compared to real-world terrain.

A TOC and CTCP appear on the simulated terrain but personnel inside the posts cannot see the SIMNET terrain. The TOC, CTCP, and other command post (CP) personnel communicate with vehicle simulators using CB radios which serve to represent normal FM tactical radio networks. Fire support (i.e., artillery, mortar, and close air support), logistical, and maintenance support are controlled from computer WSs within the TOC and CTCP, respectively. Effects from the WSs are integrated into the simulation, i.e., artillery rounds initially fired from the fire support WS impact on the SIMNET battleground and disable and destroy vehicles.

The MWSTC has additional features to support training. Semi-automated forces (SAFOR) capability is available to simulate friendly and opposing forces. Opposing forces can be played by SAFOR or manned by personnel for force-on-force engagements. For AARs, a Data Logger can be used to maintain records of exercise activities and a Plan View Display (PVD) can be used to provide a graphic map display of battlefield activities during replays of the completed battle in a MWSTC classroom. For additional detail and information about the MWSTC refer to The 12th Cavalry Regiment Combined Arms Tactical Training Center (CATTC) Users' Guide (U.S. Army Armor Center, 1990).

Mounted Warfare Test Bed (MWTB)

The Fort Knox MWTB is a distributed interactive simulation facility containing low cost, distributed networked simulators that are used to simulate battalion and below combat operations in a virtual battlefield environment. This virtual simulation allows manned and semi-automated weapon platforms to interact on a digitized representation of real world terrain. The central components of the MWTB are the weapons platform simulators which model the behavior of the real (or conceptualized) platform as much as possible and contain the minimum level of detail necessary for the crewman or operators to perceive the systems as realistic and useful. Visual and sound components are provided

to simulate battlefield-oriented perceptual cues to reproduce key aspects of the battlefield operating environment. In addition to the simulators, a variety of computer-based systems are used to provide (a) tactical communications, (b) scenario monitoring and control, and (c) data collection and analysis capabilities (Leibrecht, Winsch, Ford, Sawyer, Meade, Ainslie, Smith, Sever, and Doherty, 1993).

Leibrecht, et al (1993) detailed a comprehensive list of MWTB features which are adapted to provide the following brief descriptive listing. The relevant MWTB major features include:

1. Manned simulators which contain selective fidelity crewstations with supporting HW and SW (including digitized terrain database).

2. Voice (and digital) tactical communications on a SINCGARS network for linking manned simulators and control stations.

3. Surrogate vehicles added to the battlefield via a SAFOR program which creates and controls unmanned friendly and enemy vehicles and aircraft.

4. Scenario control accomplished through a Management, Command, and Control (MCC) system which provides a capability to initialize and monitor manned simulators and implement fire support.

5. Scenario monitoring accomplished via (a) a PVD which provides a "bird's eye view" of the simulated battlefield and supports map manipulation and event flagging and (b) a stealth station (including a large screen monitor) for viewing the battlefield from various viewpoints.

6. Data recording and analysis accomplished via a Data Collection and Analysis (DCA) system which allows recording (and playing back) automated data and performing off-line reduction. It consists of a DataLogger for capturing all network data and two types of analysis SW: DataProbe and RS/1 (registered trademarks of BBN Software Products Corporation).

7. Simulation network control accomplished with a network control station which has the capability to save and restart exercise states.

While it is important to understand the advantages, and limitations of the MWTB, it is not necessary to recount all the detailed information in this report. Previous documentation (Miller and Chung, 1987; BBN Systems and Technologies Corp., 1991) and ARI reports (Du Bois and Smith, 1989; O'Brien, Wigginton, Morey, Leibrecht, Ainslie, and Sawyer, 1992) thoroughly describe the MWTB capabilities and constraints.

Janus Facility

The Janus system is a constructive combat simulation system designed to provide tactical training for Plt through Bde level leaders, Cdrs, and their staffs. Soldiers can interact with the simulation through computer WSs with trained personnel or unit trained personnel. The battlefield is portrayed as birds-eye view representations of terrain, vehicles, maneuver, and fires. It is a two-sided, free-play simulation that provides a realistic environment for leaders to train their Cdrs and staff in combat operations. The Janus simulation system allows soldiers to interactively participate in combat scenarios involving: (a) maneuver; (b) fire support; (c) air defense; (d) engineer; (e) nuclear, biological, and chemical (NBC); (f) tactical air; (g) air transportation; (h) army aviation; (i) logistics (limited); (j) air assaults; and (k) threat operations. Typical missions that can be conducted include: (a) offensive operations, i.e., movement to contact, hasty attack, deliberate attack, and exploitation and pursuit); (b) defensive operations, i.e., hasty defense, deliberate defense, delay, and withdraw; and (c) other missions, i.e., air assault, guard, screen, reconnaissance and counter-reconnaissance, rear area, deep attack, tactical road march, and occupation of assembly area or battle positions.

The simulation has extensive advantages and capabilities including:

1. The ability to accomplish training objectives by selecting the type of (a) combat scenario, (b) theater of operations and terrain database, (c) friendly forces based on TO&E and task organization, (d) opposing forces based upon regional threat capabilities and doctrine, and (c) initial starting conditions.

2. The capability to model friendly and opposing force vehicles and weapon systems including how the systems are affected by terrain and weather.

3. The capability (using an extensive database) to program equipment details such as (a) individual fighting system properties, (b) dimensions, (c) weight, (d) carrying capacity, (e) speed, (f) weapons, and (g) weapons capabilities, i.e., range, type of ordnance, and ammunition basic load. Other programmable factors include (a) day or night, (b) mission oriented protective posture (MOPP) level, (c) battlefield obscuration, and (d) percentage of starting forces.

4. The capability to "re-fight" battles using different TTPs, weapons, and numbers of soldiers or vehicles. A Cdr can use a "branch point" capability to stop a scenario at any point, capture the data, and continue the exercise. After the exercise is completed, the scenario can be restarted at the branch point and played again with different settings.

5. The opportunity to train on actual terrain that has been digitized, that realistically affects visibility and movement, and is displayed in a form familiar to military users, i.e., contour lines, roads, rivers, vegetation, urban areas, etc.

6. The capability to conduct extensive AARs using battle replays and post processor displays to display battle reports on screen or in printed form.

It is claimed that the Janus system realistically trains leaders, Cdrs, and staff by forcing them to consider all military aspects and employ their forces as in actual combat. Leaders and staff are given the opportunity to consider all factors of mission, enemy, terrain, and troops in planning and fully synchronize all elements to accomplish missions. Unit leaders are provided the opportunity to fight their plans and operations orders (OPORDs) through synchronization of BOSs, time and space management, and tactical decision-making based on simulated battlefield activities and intelligence.

As currently used, Janus can assist leaders, Cdrs, and their staff to: (a) enhance command and staff procedures, (b) exercise and refine decision-making processes of the Cdr and leaders in CA operations, (c) observe and analyze effects of decisions, (d) improve interaction and coordination among unit personnel, (e) develop confidence between Cdr and soldiers, (f) exercise communication capabilities and procedures, (g) evaluate tactical standing operating procedures (SOPs), (h) effectively employ all indirect fire systems, (i) integrate obstacle plans into combined arms fights, and (j) provide data to facilitate AARs (U.S. Army Armor School, 1995a).

Task Force Training Strategy

The TF 2-33 AR's training strategy was planned according to a "crawl-walk-run" approach with integration of live, virtual, and constructive simulation training events throughout home-station training. Based on the training strategy model from AWE Operation Desert Hammer VI (refer to Figure 3), a deliberate effort was planned for the Bn to gain proficiency in combat fundamentals as well as digital equipment training. The TF planned their strategy in January with a working knowledge of planned training in simulation as well as AWE FD experiments that would serve as TF slice and collective training events. Figure 9 illustrates the TF's training strategy to achieve collective digital warfighting capability.

The training strategy proceeds in a clockwise order starting with the upper left corner of Figure 9. The crawl phase was planned to start in January 1995 with M1A2 new equipment training (NET) and M2A2 NET (which did not occur). Virtual and constructive simulation were planned with the intent of using the Simulation-based Multi-echelon Training for Armor Units (SIMUTA) program (Turecek, Campbell, Myers, and Garth, 1995). In the

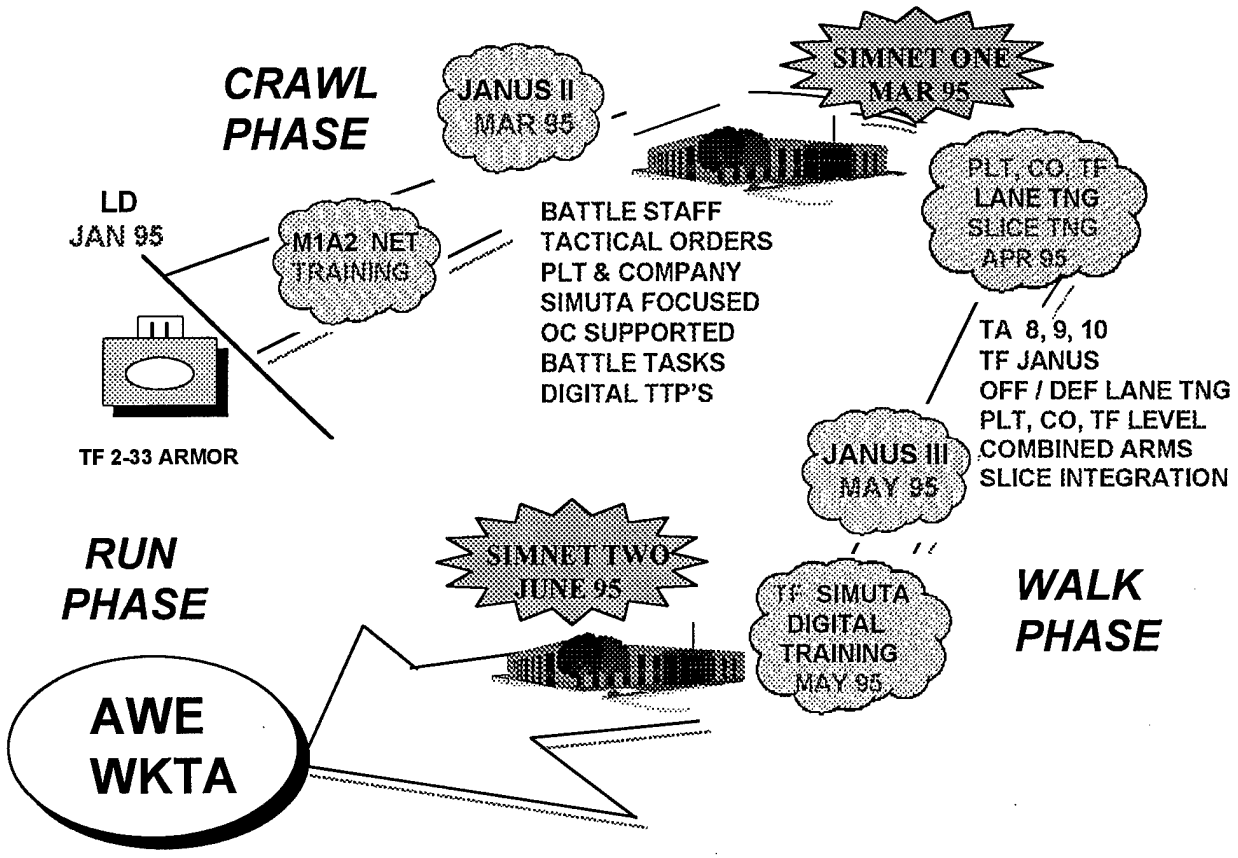

Figure 9. Task force training strategy (J. E. Orr, personal communication, 1995).

program for virtual simulation (SIMNET One), Plt, Co, and Bn staff would undergo conventional collective training using realistic scenarios while being observed by EXFAC personnel. Staff members would receive detailed feedback at each echelon level and then as a unit to enable them to find and correct weaknesses in their performance. In the constructive simulation (Janus II), the Cdrs and staff would use the same approach as the virtual program to train staff decision-making and BOS synchronization processes as a conventionally-equipped force. As the unit moved into the April timeframe, the Plts, Cos, and TF were to conduct lane training and TF slice training with CA slices integrated into live simulation in local training areas 8, 9, and 10 at Fort Knox. As proficiency improved and the unit proceeded into the walk phase, the TF was to proceed to digital TF slice training in constructive Janus collective training and virtual collective training with the SIMUTA method.

Prior to the run phase at WKTA, the TF was scheduled to conduct a full digital TF rehearsal in virtual simulation. During this TF rehearsal on a WKTA database, they were to perform the same missions with the same digitized organization they would use in the final live simulation experiment. Unfortunately, resources, scheduling constraints for facilities

and supporting CA elements, and delays in arrival of equipment and digital terrain databases altered the planned events. The TF training strategy was altered based on the limitations imposed on the unit. The training timeline schedule presented in the next section provides an overall description of actual events that occurred within the planned home-station training.

Training Schedule

The training schedule does not include all TF training conducted during AWE FD. It was not possible to observe all the TF training due to the limited number of ARI personnel available. Although CO-level and below training occurred frequently (e.g., CO-level SIMNET exercises), these events were not included. Also, logistical exercises (LOGEXs) and some Bn-slice events were not observed. However, some individual training events were observed. Training observations were limited to: (a) TF-level training events, (b) events involving digital training, or (c) events having implications for future Force XXI training.

Although the AWE FD officially started with constructive modeling in September 1994, training for AWE FD did not start until January 1995. (The TF 2-33 AR was not tasked as the experimental unit until January 1995.) The TF training was conducted from January to August 1995, just prior to the start of the Live-Virtual experiment. Several significant training events transpired during that timeframe. Figure 10 depicts the training events interspersed with ongoing AWE FD sub-experiments. For training purposes, some of the sub-experiments served as relevant collective training experiences for the TF and are noted as training events on the timeline.

As illustrated, the timeline includes the initial start of AWE FD with Janus I, a constructive simulation experimental event. Starting in early January, NET occurred for the TF's B Co/Tm and was attended by ARI personnel for familiarization and observation purposes. The TF personnel received a classroom presentation on IVIS and digital TTPs in early February. The IVIS hands-on training (in the motor pool on actual equipment) and IVIS WS training were conducted (in the TF DLC) in February. A Janus CPX with the staff and a slice of TF personnel was conducted in mid February. Individual, group, and slice sustainment training on digital equipment and WSs started in early March and lasted through early June.

A Janus constructive experimental event happened in mid-March. During that timeframe, hands-on B2C2 training was conducted in a classroom setting (in the MWTB) for TF, CS, and CSS personnel. In late March to early April, the full Bn complement trained conventional individual, team, staff, and Bn in the MWSTC (and surrounding area) using SIMUTA collective training exercises. Through mid-April, the primary TF slice with CA elements participated in the first virtual simulation (VS1) experiment to refine TTPs and practice collectively on SIMUTA-

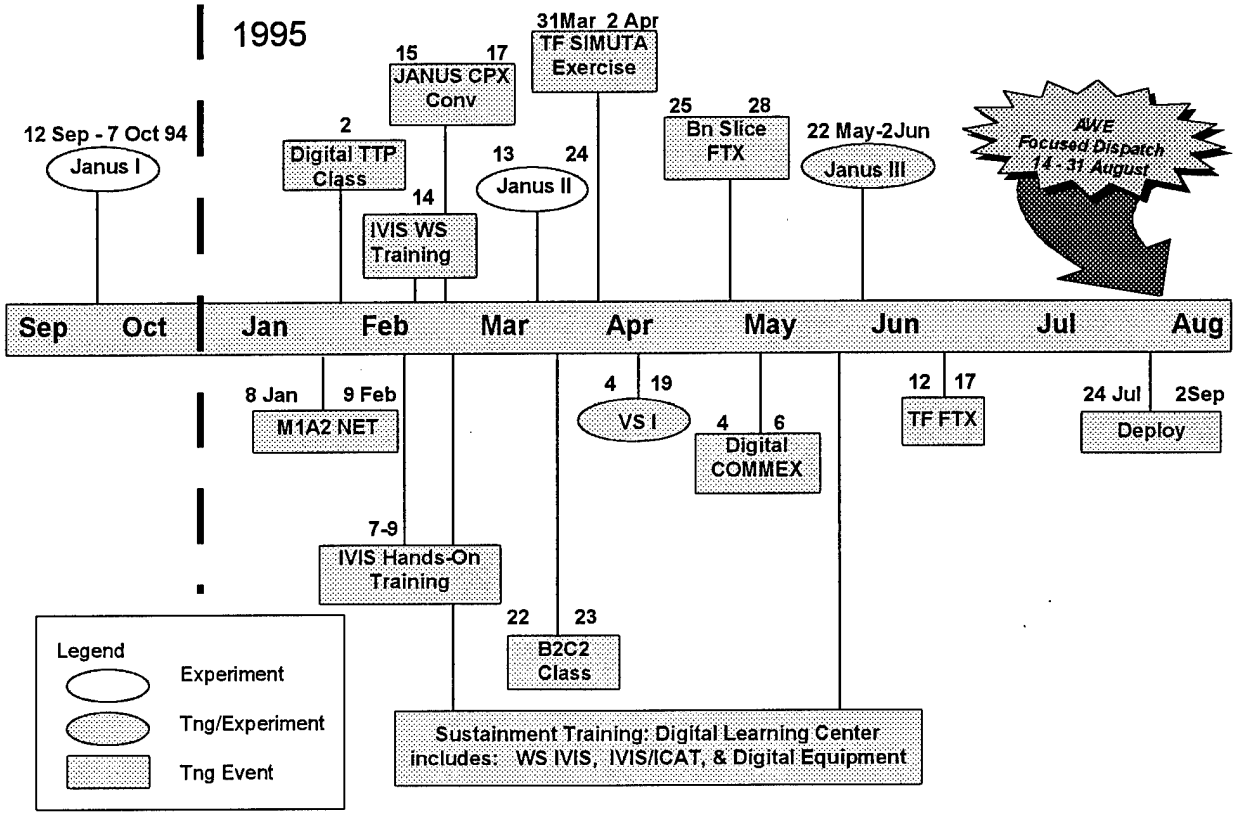

Figure 10. Task force timeline of training and Advanced Warfighting Experiment Focused Dispatch sub-experiment events.

based mission scenarios. At the end of April, the Bn conducted digital training from the DLC with the B Co/Tm logistics elements in the field to replicate a Bn-slice FTX.

In early May, the staff conducted a digital COMMEX between the DLC TOC and Co Cdrs in M1A2s in the motor pool. In later May to early June, the Bn command and staff elements participated in a Janus constructive simulation experiment that included collective practice on upcoming missions for the Live-Virtual experiment. In mid-June, the TF conducted an FTX in local training areas with digitally equipped C2 vehicles, Co/Tms, Bn CA elements, and CS and CSS assets to rehearse all aspects of upcoming TF missions for the AWE.

The TF elements started deployment to the WKTA in late July. Prior to the start of the experiment during August, refresher and update training on B2C2 was taught as a class to CS and CSS elements. During this timeframe some collective digital training rehearsals were conducted. The TF participated in the Live-Virtual experiment during August, and returned to Fort Knox in early September.

Training Events

The following training events are presented in chronological order. Event descriptions are based on direct observation of the training, AAR notes, soldier comments, and TF documentation. Some training events were more accessible than others because of the nature of the training event. Generally, individual and small group training events and Janus constructive simulation events were directly observable. However, most collective training event information was collected through indirect observation. For example, indirect observation was performed in the MWTB through monitoring PVDs, radio traffic, and digital traffic or in field events by monitoring radio and digital traffic. In these cases, most data were collected after the fact through attending AARs, in talking with officers involved in the training, and through questionnaire and interview sessions.

The following format is used in describing training events. First, a basic description of the event is presented including the type of training and dates conducted, the target audience, trainers (if applicable), and duration of activities. Second, the training goals are described with information about training goals and objectives. Third, a description of the training environment is portrayed including training site and layout, personnel, equipment, materials, and any training distractions contained in the environment. Fourth, training execution and methods used for training are described. These methods include lecture, demonstration, practical exercises, pacing, simulation, and training aids. Fifth, training assessment methods used to provide feedback are described. Last, a summary including soldier perceptions (when appropriate) is provided that highlights critical training points about the event. (Soldier ratings and perceptions are contained in Appendix E.)

M1A2 NET

Training overview. M1A2 NET was conducted for TF 2-33 AR B Co/Tm personnel to transition soldiers already qualified on the M1A1 Abrams tank to new systems incorporated on the M1A2. Training consisted of lectures and hands-on operation of the new systems, with technical training information presented in a technical manual (TM), TM 9-2350-288-10-1, Operator's Manual, Operator Controls, PMCS, and Operations Under Usual Conditions, Tank, Combat, Full-Tracked: 120-mm Gun, M1A2 (Department of the Army, 1995e) provided to each student. Training took place in buildings 485 and 486 at Fort Knox over a period of approximately 17 days during the hours of 0800 and 1600. Students were grouped together as four-man crews for purposes of hands on training on the M1A2 equipment, and one instructor was assigned to provide hands-on training to each crew. Training was provided by the M1A2 NET team, B Troop, 5/16th Cavalry, located at Fort Knox.

Training goals. Training goals were to train students on new systems that have been incorporated into the M1A2. Training

goals were briefed during lectures, and a written training schedule was provided to each student. New systems include the Driver's Integrated Display (DID), Cdr's Integrated Display (CID) which includes the IVIS version 2.3.2 SW and Cdr's Independent Thermal Viewer (CITV), and the Gunner's Control and Display Panel (GCDP). Training objectives were to have the students successfully pass Go/No-Go evaluations of their ability to perform basic functions with the new systems.

Training environment. The training environment included lectures in motor pool building 485, and hands-on training and on-the-equipment lectures in motor pool building 486. Students also participated in driver training exercises, and a live-fire exercise at a local range. The lecture room was a large motor pool bay which provided poor acoustics for hearing the instructors. Hands-on training with an instructor on the M1A2 equipment provides necessary experience for students to practice and explore the procedures presented in lectures and written materials, but also had some limitations. Access to equipment for hands-on training was limited because not all students in the four-man crew could get into the turret to see what tasks were being performed. Two factors limited student access to hands-on training in the turret. First, the limited room reduced access to two, or at most three, students and an instructor. Some students viewed training through the open turret hatches. Second, often one student was required to man the driver's station so that the M1A2 could be run to provide electrical power to the systems. Auxiliary power units were not available for all M1A2s used in training. Noise from vehicle motors, the requirement to man the drivers station, and the need to refuel and jump-start vehicles were training distractors during NET.

Training execution. Training included lectures, hands-on demonstrations provided by instructors to each crew, and practical exercises for each lesson. Students were provided with a training schedule so they would know what material to read ahead of time. Training for each lesson began with a classroom lecture, and was followed by having students move to their assigned M1A2s where their instructor demonstrated the procedures described in the lesson. This demonstration was followed by each student performing the procedures on the equipment. Written student supplemental training materials were distributed. These materials provided an elaboration on new systems in the M1A2 and enlarged diagrams of system components. Gunnery skills were first practiced in the motor pool area, with a live fire exercise at a local firing range serving as a final event in the program.

Training assessment. Training assessment methods included questioning students as part of the lecture process, and a written examination in class on M1A2 conduct of fire procedures. Each instructor had his student crewmembers perform tasks associated with each lesson during hands-on training. A formal Go/No-Go test was given on procedural tasks on the CID including the IVIS and CITV. Students were given specific IVIS tasks to

perform such as power-up the station, use of map tools, preparing reports, and log-off tasks, which had to be completed within a prescribed time standard. Students were provided with written materials describing evaluation procedures and standards. The materials were titled "M1A2 Tank Commander's Station Scoresheet", "Fort Knox M1A2 Gunnery", "Crew Duties in Response to a Fire Command", and "Evaluation Procedures and Standards For Tables IV, V, VI, VII and VIII." These materials were provided prior to evaluating new equipment procedural skills in the motor pool, and gunnery skills in the live fire exercise.

Summary. The M1A2 NET training provided an effective means of transitioning qualified M1A1 crews to the new M1A2 systems. The B Co/Tm Cdr, the only TF 2-33 AR participant of the participants sampled, stated that the instructors were very professional in their conduct of the course. The hands-on training was a useful way of having soldiers explore the capabilities of the new systems. Lack of suitable auxiliary power sources required that the M1A2s be run to provide power to the electrical systems, which presented a number of training distractors with reulting losses in training time, i.e., noise, the requirement for a student in the driver's station, and the need for refueling and jump-starting vehicles.

Digital TTP Class

Training overview. This classroom lecture session was conducted February 2 from 0900 to 1500 hours in Boudinot Hall, classroom 4. Two M1A2 digital SMEs (armor officers) conducted the lecture. The Cdrs, staff, and Plts with crewmembers from TF 2-33 AR attended. Morning and afternoon sessions were directed at familiarization with M1A2 IVIS operations and a TTP overview using IVIS as the main digital platform.

Training goals. The training goal for the morning session was to familiarize TF 2-33 AR with IVIS operations. (Only five personnel had previous experience with IVIS.) Topics for IVIS familiarization included: (a) IVIS routing matrix; (b) message reports; (c) overlays and graphics; and (d) net address concerns. The afternoon session provided instruction on digital C2 TTPs. Topic areas included: (a) CP operations; (b) main CP; (c) C2V; (c) BFV IVIS system; (d) CTCP; (e) troop leading procedures (TLPs); (f) M1A2 TTP overview for Plt, Co, and TF level; (g) IVIS rehearsals; (h) integrating information; (i) planning functions; (j) leader's reconnaissance; (k) reconnaissance; (l) defensive operations; (m) offensive operations; and (n) other tactical operations.

Training environment. Training was conducted in a classroom auditorium with vertical, multi-tiered seating arranged in a horseshoe-shape facing the lecture area. Layout included a large projection screen with slide projection capability and two closed-circuit televisions with a video cassette recorder (VCR) for conducting multi-media training. Overhead lighting was

adequate and ambient background noise minimal. Viewing the video presentations was less than adequate from greater distances in the higher-tiered levels of the auditorium although hearing was not a problem.

Training execution. The instructors team-taught the instruction, with each officer teaching different topics. Two video presentations, one on Force XXI objectives and one on IVIS operations, were shown after brief introductions. After the video presentations, the instructors conducted overhead slide presentations with lecture as their method of training. A shirt-pocket graphic training aid (GTA) of the IVIS routing matrix and net identification was made available to all attendees. The TF personnel were informed of the availability of laptop PC IVIS emulation SW for practicing IVIS familiarization. They were also told about the availability of a complimentary programmed text for learning and practicing automated overlay techniques and the digital routing matrix.

Training assessment. No training assessment was conducted. All questions were answered during the session by instructors.

Summary. Of 17 respondents, 13 reported attending this training event. Seventy seven percent of the attending respondents agreed that the training objectives were clear for this class. Sixty two percent indicated the presented information was helpful in preparing for digital operations and 54% thought need-to-know information was presented. Some of the dissenting comments indicated there was a mixture of need-to-know and nice-to-know information without identification of which was which.

Although observations indicated some problem with viewing the video presentations, all 13 respondents in attendance indicated they could see and hear the instruction and video presentations. As for training execution, 70% of the attending respondents indicated that explanations of technology and terms were adequate for understanding digital operations. Only 38% felt the training materials were available, necessary, and easy to use whereas 62% felt the GTA (IVIS Reference Guide) of the digital routing matrix was accurate and helpful in later use. This last response was related to how many actually used IVIS in later operations. Sixty nine percent of respondents indicated training time was used efficiently. Seventy seven percent felt that feedback was satisfactory, i.e., their questions were answered satisfactorily.

IVIS Hands-on Training

Training overview. This hands-on IVIS training was conducted by an M1A2 NET team instructor in a motor pool (Building 486A) at Fort Knox, KY. The training was conducted for three days during 0900 to 1500 hours with an hour break for lunch. This abbreviated training program of instruction (POI)

was designed to train IVIS (SW version 2.3.2) operations. Five soldiers from TF 2-33 AR attended the training.

Training goals. The overall training goal was to train soldiers in the hands-on use of IVIS. The training was derived from a stand-alone IVIS system for High Mobility Multi-purpose Wheeled Vehicle (HMMWV) named the Tank Tactical Control Center (TTCC). Six POI lessons with distinct task oriented lessons were presented during the course of training. The objectives of the lessons were to train the following tasks: (a) Prepare the TTCC for operation; (b) Operate IVIS; (c) Prepare, send, and respond to reports; (d) Mission planning; (e) Perform diagnostics on the M1A2 TTCC; and (f) Power down and secure the TTCC.

Training environment. The training was conducted in a motor pool building with a TTCC and an M1A2 tank for sending and receiving communications during appropriate hands-on training activities. Instruction took place on the TTCC with a seat for the instructor (or one student) to operate the equipment while other students watched over his shoulder. Seeing the operation was sometimes problematic due to lack of appropriate space and poor overhead lighting. Noise was a problem during battery charging for the M1A2. Cold was also a problem, especially when students had to remove gloves for hands-on operations.

Training execution. Instruction was systematically presented with lessons taught in sequence. Each function of IVIS equipment was described and demonstrated with questions and tryout allowed. At the end of each lesson, a practical exercise was given. The practical exercises included random questioning by the instructor and presented opportunities for students to practice on the particular functions from the lesson. Written materials were not provided during training but the lesson plans were given to the students at the conclusion of all the training. Students developed "cheat sheets" and notes of IVIS menu operations in lieu of receiving job aids.

Training assessment. Training assessment was performed during lessons as practical exercises were conducted. Students successfully completed their training by performing key procedures from the POI on the IVIS.

Summary. Of 17 respondents, only the B Co/Tm Cdr reported attending this training event. (While the attendance of this event seems low, there were several NCOs and enlisted personnel in attendance.) The B Co/Tm Cdr indicated the training objectives were clear, that need-to-know information was emphasized, and that he was confident he developed the skills necessary to operate the system.

Although observations indicated some problem with viewing the instruction, the respondent indicated he could see and hear the instruction. No problems with access to the equipment or problems with the equipment were reported. Environmental

distractions were not reported. There was one problem noted in comments about training aids. The officer noted that a whole series of GTAs need to be developed for the M1A2 including SINCGARS setup. Observations tended to support this comment. During training it was noted students had a need to diagram the IVIS menu functions to navigate through its functions. Also, students noted a desire for a pocket sized reference book on SINCGARS and IVIS procedures tailored to their duty needs.

As for training execution, time was perceived to be ample and to be used efficiently for training. It was also perceived that the training was sequential and practice time with hands-on operations was ample. As for assessment, the testing instructions and feedback from performance were rated as appropriate. It was perceived that there was opportunity to go through remedial training and the opportunity was available when needed.

IVIS WS Training

Training overview. This class on IVIS operations was conducted by Bn personnel in the DLC, Building 1479, from 0700 to 1130 hours. The IVIS SW (i.e., version 2.0) was loaded on to Sun SPARC WS. The target audience was TF 2-33 AR S2/S3 shop, a Fire Support Element (FSE) section, and two tank Cdrs.

Training goals. The overall training goal was to conduct small team training in IVIS operations. The first half of the training session was devoted to IVIS individual training using a programmed text package that was designed to work with the IVIS PC emulation. The IVIS individual training included training the following functions: (a) automated overlay techniques, (b) digital message routing matrix, and (c) automated tactical reports. For the second half of the training session, soldiers practiced constructing and sending overlays and sending and receiving combat reports.

Training environment. Training was conducted in the TF 2-33 AR DLC. The classroom and WS were in an environment that was well lit and was free from noise distractions. Equipment for training included six Sun SPARC WSs loaded with IVIS SW version 2.0; a version that did not have all the features of the real IVIS version 2.3.2 SW. (One soldier who had received IVIS NET training on the real equipment stated that 27 important log-on steps were not present in the DLC IVIS version.) Seating was adequate for all trainees. Instruction was provided by the S3 and S2. The Bn Master Gunner and operations NCO served as assistant instructors. No WS manuals were present.

Training execution. The desired IVIS training approach was to start with the laptop computer-based training for individual training, move on to the learning center WSs, and then proceed to hands-on experience with the real equipment. During the session, IVIS SW training was conducted using five of six Sun SPARC WS

that were linked together allowing soldiers to pass IVIS messages to one another. The WSs were set up to represent various command and tactical unit functions. Students used a mouse to activate IVIS buttons which appeared on the computer screen.

For the second half of the training session, the S2 had soldiers assume the roles of the Bn S2 shop, S3 shop, and Fire Support Element (FSE), i.e., mortar. Tank Cdrs (TCs) assumed the roles of tank Co Cdrs for Cos A and B. Soldiers were given an operations order. The S3 shop was given an operations overlay, the S2 shop was given an intelligence overlay, and the FSE group was given a fire support overlay with all logged in as the Bn TOC to send overlays down to the Cos. The TCs were instructed to send SITUATION and SPOT reports to the TOC. The TOC was supposed to check reports as they came in and continue to develop overlays.

Training assessment. Informal guidance was provided as soldiers trained individually and when sending overlays and reports. No AAR or formal assessment was conducted after training.

Summary. No ratings and comments were available from trainees in the sample. Observations were that job aid materials were not evident to assist IVIS procedures such as logging on, constructing and sending overlays, and sending reports. The training process was designed and executed well but no clear assessment or feedback was evident for team training. A clear problem noted was the IVIS could not automatically provide position navigation (POSNAV) updates. This function was needed to simulate movement to new positions for exercising the TOC battle tracking process.

Janus CPX

Training overview. The Janus CPX (conventional training) was conducted at Fort Knox in Skidgell Hall, Rooms 7 and 8 from 15 to 17 February. It was conducted by a team of contractor personnel in coordination with the Fort Knox Reserve Component Virtual Training Program (RCVTP) O/C team. (The O/C team were designated as the AWE FD EXFAC.) Two Bn-level SIMUTA-based MTC exercises and a SIMUTA-based DIS exercise were conducted on a NTC database. The target audience for this training event included: (a) TF Cdr, (b) four maneuver Cos and HHC, (c) Scouts, (d) Engineer section, (e) ADA section, and (f) FS sections (including field artillery (FA) and mortar). Staff included the XO and S2 and S3 sections, a CSS section, and a FS section.

Training goals. The training goal was to allow the TF Cdrs, staff, and supporting elements to collectively train the staff decision-making and BOS synchronization process while operating in an interactive environment under realistic mission scenarios as a conventionally-equipped TF. The MTC and DIS exercises included collective maneuver tasks and functional area tasks.

Collective maneuver tasks included: (a) Move Tactically, (b) Fight a Meeting Engagement, (c) Attack by Fire, (d) Defend, (e) Cover Passage of Lines, (f) Withdraw Under Enemy Pressure, (g) Consolidate, and (h) Reorganize. Functional area tasks for Cdr and staff included: (a) C2 tasks which included Command and Control the Bn/Bn TF, Perform S-3 Operations, and Maintain Communications; (b) intelligence tasks which included Perform Intelligence Operations and Perform S-2 Operations; (c) fire support tasks which included Employ Fire Support and Conduct Fire Support Operations; and (d) CSS tasks which included Perform CSS Operations and Operate CTCP.

Training environment. The exercises were conducted in the Advanced Research Projects Agency (ARPA) Janus facility in Skidgel Hall. Training was provided by Janus facility personnel including government and contractor personnel. Trainers and evaluators for the event were the EXFAC.

The facility was environmentally controlled with excellent lighting but some background noise was noticeable from open room operations, i.e., background radio and voices easily heard between partitions that separate different WS areas of Bde, maneuver, and staff sections. The maneuver sections were contained in one open room. The open room included (a) a contractor exercise support area and (b) Bde, Bn Cdr, S3, Co Cdr, PL, and HHC Janus WS areas (with CB equipment) partitioned by removable divider panels. In an open room across the hall from the maneuver room were WS sections partitioned with wooden barriers with open tops. These sections contained SAFOR control WS area and a TOC area; each equipped with CB communication equipment. Additionally, partitioned areas equipped with CBs were available for FA, Mortar, and CSS sections. Within each partition was a WS with a "puckster" (i.e., operator) to input the TF personnel commands for that particular station. The WS also provided the TF personnel with their birds-eye view window of the battlefield for participating in the exercise. The Janus simulation served to drive the scenarios with contractor personnel operating the SAFOR and other control stations.

Seating was not always adequate for TOC staff. This inadequacy resulted in very crowded conditions owing to the number of TOC support personnel, observers, and EXFACs present in or near the partitioned room. Space for writing, battle planning and tracking on maps, and operating radios was constrained resulting in sometimes awkward procedures for coordinating staff work. Occasionally, the CB radios used for net communications went out of operation or speakers were rendered inaudible.

Training execution. The TF received SIMUTA-developed (a) OPORDs, (b) overlays, (c) maps, (d) intelligence preparation of the battlefield (IPB) information, (e) synchronization matrix, (f) courses of action (COA) information, and (g) other materials. These other materials were designed to provide the products of the planning and preparation phase and allow the unit to focus

quickly on the execution phase. The TF received the Bde OPORD and proceeded by conducting an abbreviated planning and preparation phase. During the planning and preparation phase they refined their Bn orders, control measures, synchronization matrix, COA, and mission plans.

Prior to executing the mission, the TF leaders and staff conducted a walk-through mission rehearsal in the hallway between the two rooms. A representation of the battlefield was depicted on the floor with tape, models, marked cards, and white tape. Control measures such as phase lines, locations of positions (i.e., assembly areas, battle positions, and pre-planned FS positions) were outlined on the floor with tape. Red painted enemy equipment models were used to represent the Combat Reconnaissance Patrol (CRP), Forward Security Element (FSE), and Motorized Rifle Bn (MRB). The S3 led the rehearsal with leaders and staff giving a short description of what they were doing as they rehearsed and refined each phase of the battle they were to conduct.

The TF personnel then reported to their stations and executed the battle. The EXFACs observed and coached TF personnel during the battle as needed. Also, during the battle, the EXFACs recorded notes on forms that later allowed them to focus AAR comments. As TF elements were "killed" during the battle, they ceased to participate as TF entities on the constructive battlefield. The exercise ended when the TF or enemy unit was rendered combat ineffective; a decision made by the senior EXFAC officer. After the mission was over, TF personnel received feedback from the EXFACs.

Training assessment. A formal external AAR was conducted that focused on BOS functions and tasks. The EXFACs collected performance information on collection forms geared to task execution within each BOS functional area. Some key areas on each form were concentrated on C2 and the coordination and dissemination of information. At the conclusion of training, EXFACs responsible for particular BOS functional areas provided "stovepipe" AARs to specific sections they observed. For example, the TOC EXFAC provided feedback privately to the S2 section then the S3 section then the whole TOC. After stovepipe AARs had been conducted, the TF assembled in a briefing room where they received an overall AAR conducted by the senior EXFAC officer. The focus of the AAR was on BOS areas and integration and synchronization of the battle with these elements. The TF received a computer-projected, fast-forward version of the battle with stopping points at certain key phases where discussion concentrated on certain relevant points. Summaries and totals of engagements were tallied and presented. Key points and discussion focused on BOS functional integration and synchronization and lessons learned for future improvement.

Summary. Of 17 respondents, 14 reported participating in this event. Of the 14 reporting, 79% indicated they were

proficient in conventional tasks prior to the start of this event. All respondents perceived clear training objectives indicating they understood the missions, tasks, conditions and standards to which they were supposed to perform.

For the training environment, 43% reported experiencing training interruptions due to intermittent Janus simulation crashes. One crash caused the loss of one-half a day of training. Contrary to observations, slightly over 64% reported no problem with equipment layout and locations. However, 36% reported problems including (a) cramped areas around the WS, (b) overhearing the TOC, (c) a problem with location of FS personnel, i.e., FSO, and (d) a problem of not being configured as they would fight. Although 71% of respondents indicated no problems with performance due to equipment or unrealistic simulation, 29% indicated a problem. Observations and comments made confirm CSS was not played or was simulated less than realistically in this event. Over 64% of respondents indicated written materials were present for assisting training although one comment indicated "cheat sheets would have been helpful."

According to respondents, training was executed well with 86% agreeing training was effective and efficient. All perceived training as conforming to appropriate doctrine. A majority of respondents (86%) indicated having received orientation training on the simulation, WS, and SW capabilities and limitations prior to event start. Approximately 79% reported having received hands-on practice or experience with the simulation prior to starting this event. In terms of training assessment, all but one respondent agreed that training feedback was focused and that EXFACs provided valid and credible observations. All respondents agreed lessons learned were identified and helped them in sustaining and improving their performance.

Sustainment Training

Sustainment training, for purposes of report organization, includes initial IVIS PC tutorial training, programmed text training, and IVIS-ICAT courseware training. Although initial IVIS familiarization training was done individually on personal computers in different settings (i.e., home, TF HQ, etc.), all three IVIS training programs were used in the DLC during sustainment training for the unit. No direct observations of soldiers using these materials were made in a training setting.

Training overview. The IVIS emulation program was a stand-alone IVIS SW (i.e., version 1.9) program that could be operated on a laptop or desk PC. It emulated some functions of the IVIS including log on/off, reporting, and graphic overlay functions. It could be operated as a stand-alone operation to practice limited IVIS functions or used in conjunction with other training materials to conduct practical exercises.

The programmed text consisted of three separate lessons: automated overlay techniques, digital message routing matrix, and automated tactical reports. The programmed text presented background information, provided some testing of acquired knowledge with questions at the end of the lesson, and was designed to be used with the PC emulation SW. Both SW and programmed text materials were distributed to the TF prior to February 2.

The IVIS-ICAT courseware was originally installed on three of six WS on 13 March with subsequent installation performed on the other WS. It was designed by National Aeronautic and Space Administration (NASA) contractors to be run on a Sun SPARC WS using a UNIX operating system and an X-Windows graphical user interface. The IVIS-ICAT program was designed to be run as an IVIS emulation or as an individual trainer. The IVIS emulation component of the program was based on IVIS SW version 1.9 and could be networked to other WSs for training teams, Plts, Co slices, etc. The IVIS emulation could be initially set up to run as an emulation or to run as a training system for individuals. The courseware for training individuals contained interactive computer-aided teaching modules including: (a) basic skills including passwords, keypad familiarization, setting user identification, using map tools, and setting up communications; (b) creating reports; (c) receiving reports; (d) automated overlay techniques; (e) creating overlays; and (f) receiving incoming overlays.

Training goals. The training goal for the PC IVIS emulation SW and programmed text was to provide initial familiarization training of IVIS. Additionally, the IVIS emulation SW was to provide an individual sustainment capability. The IVIS-ICAT program was also designed to train initial operations on IVIS with the added capability to provide net capability to assist collective training of small groups.

Training environment. The PC IVIS emulation SW and programmed text were designed to be used anywhere an individual could use a laptop PC. The IVIS-ICAT program was designed to be used on Sun SPARC WS which limited the portability of the system for the TF. This program was used on WSs in the DLC. (The DLC environment was previously described in the IVIS WS training event.)

Training execution. The PC IVIS emulation SW and programmed text were to be used by individuals in any timeframe or environment prior to conducting operations on an IVIS system. The strategy was to have individuals complete this self-paced training prior to coming to the TF DLC to use the IVIS WS. The IVIS-ICAT WS training, as well as digital equipment training, was available according to a determined schedule. Each week, starting in March, each Co had use of the DLC one day per week. The HHC, support elements, and staff were allotted the last day of the week for training. Each Co conducted training according

to whatever they considered necessary for training and sustaining their soldiers on IVIS and other equipment. The schedule was interrupted for special events such TF slice training or COMMEXs.

Training assessment. Other than questions and answers contained in the programmed text and IVIS-ICAT courseware, no training assessment was provided. When the IVIS-ICAT was used as a net emulation, the trainers provided on-the-spot answers and feedback when conducting small group collective practical exercises. The programmed text had no basic remediation other than what was already presented in text. The IVIS-ICAT system had a built-in diagnostic and remediation capability based on the student's pattern and level of concept mistakes made during training. Feedback was provided at the appropriate level of explanation based on the user's background. A description of the system and its capabilities (including remediation) can be found in the IVIS-ICAT User's Guide (National Aeronautics and Space Administration, 1995) and a paper titled "Intelligent Tutoring and Training White Paper" (Way, 1993).

Summary. Each of the following summaries of participant ratings, comments, and observations are organized by training method.

The PC IVIS emulation was used in conjunction with the programmed text lesson on automated tactical reports. Of the 17 participants, 16 reported using this method in training for IVIS operations. All but two respondents indicated training objectives were clear. One of the two dissenting respondents indicated manuals were not written for the emulation SW. All reported having access to a PC to use the SW but 50% reported having equipment and SW problems. Comments reveal there were (a) mismatches between the IVIS emulation SW and the actual IVIS system, (b) mismatches between the SW and the programmed text, and (c) system or program crashes. Over 62% reported being confused because of the differences between the IVIS emulation SW and the actual system. Some comments attributed the confusion being caused by differences in the log-on procedures. Despite the problems encountered, 81% perceived that (a) the training was efficient (as compared to other IVIS training methods), (b) that the programmed text with the emulation SW was a better approach than just using the SW, and (c) that the combination of both was good training. Comments indicate the approach would be better if training or explanations for its use were given or help functions were available in the program. All reported they were able to practice as much as they needed and 81% thought the programmed text was easy to follow and use. However, only 56% thought this training provided adequate explanations of new terms and concepts and only 44% indicated training feedback was sufficient. Although this training was laden with problems, 88% of the participants thought the Army should invest in this type of training for digital systems training. Comments indicate certain improvements such as improving the emulation and embedding instructional SW would be helpful.

The programmed text training included using lessons on automated overlay techniques and the digital routing matrix. Of 17 possible respondents, 13 participated in this training. All but one respondent (92%) perceived the training objectives as being clear. Also, 92% indicated the programmed text was easy to follow and use and explanations of concepts and terminology were clear. Only 46% thought the feedback was sufficient and 69% thought this training method for IVIS training was efficient compared to other methods. One comment indicated the routing matrix lesson may have contributed to a less than efficient rating. However, the IVIS programmed text method was perceived by 84% as good training compared to other methods of IVIS training. Also, 92% indicated that they thought the Army should invest in this type of training methodology for digital training.

Only nine of the 17 respondents in this sample participated in the IVIS-ICAT training. All indicated training objectives were clear in using this training program. All reported having adequate access to the WS and SW and getting to practice as much as they needed. Seven of the nine respondents felt the courseware program was easy to use and eight indicated that explanations of concepts, technology, and terms were clear. Seven of the nine participants (78%) indicated no problems encountered with the HW or SW but indicated some confusion due to differences between the IVIS-ICAT emulation SW and the actual IVIS. Comments indicate that the IVIS-ICAT differed with the actual system on certain items but was a good overall tool. Six of the respondents rated the feedback as sufficient. One of the three dissenting raters commented that the program needed to keep track of progress made by students. All nine respondents thought the IVIS-ICAT computer assisted instruction was a better approach than exploring the IVIS functions on their own. Also, all nine respondents thought it was more efficient than other IVIS training methods. All nine respondents indicated that the Army should invest in interactive courseware training technology for digital training.

B2C2 Class

Training overview. B2C2 hands-on training was conducted in MWTB in an open classroom by a contractor from Computer Sciences Corporation. Three other contractor personnel served as assistants. Personnel from the TF 2-33 AR and 16th Cavalry Regiment attended either a scheduled morning session or an afternoon session for Part I and Part II on 22 and 23 Feb, respectively. Actual training time was about 2 hours 45 minutes for each session. Part I training was attended by 19 soldiers and Part II training was attended by 17 soldiers. Officers and NCOs including Co Cdrs, some PLs, some Bn staff officers, and support personnel in maintenance, medical, logistics, and communications were in attendance at both sessions.

Training goals. Stated training objectives for Part I training were to familiarize soldiers with the B2C2 LCU and

demonstrate (with hands-on practice) the power up, log-on procedures, and general message sending. Part II objectives were to demonstrate creating and sending messages, reports, and overlays and performing shutdown procedures, recovery operations, and log-off procedures.

Training environment. Training was conducted in a classroom setting with ample overhead lighting and low noise level. Layout included an LCU with a color projection attachment for the instructor to talk trainees through the system and SW operation. Nine LCUs on five tables were provided for soldiers to sit two per LCU for hands-on practice. A copy of the TM and a draft user's guide were available at each station. The user's guide titled "Brigade and Below Command and Control (B2C2) Computer System Operator's Software User's Manual version 3.4" (dated 9 September 1994) provided the instructions necessary to run the HW and to access and run the application SW. There were no job aids, programmed text, or other stand alone training materials available. Only seven LCUs were operable, resulting in only 14 soldiers capable of participating in hands-on operations while others watched the projected display. Three contractor assistants circulated among the stations to provide help when needed.

Training execution. Training consisted of hands-on demonstration regulated by the group pace. However, the walk-through of step-by-step procedures was hurried with the instructor setting the maximum pace by illustrating which buttons to push for students to repeat his action. This training could be characterized as digital equipment familiarization training.

Training assessment. Training assessment was informal at best and immediate on-the-spot correction of errors was done (if an assistant was available). No time for remediation was available at the end of a session.

Summary. Of the 17 surveyed participants, 10 attended this B2C2 training. Ninety percent indicated training objectives were clear and 70% felt that need-to-know information was emphasized. Comments indicated that log-on and system net setup procedures were most critical for using the system in a tactical environment.

Ninety percent of the officers confirmed they could see and hear the training instruction and 80% said they had hands-on access to the equipment. Some comments reflected that the participants preferred more systems were available for training. Ninety percent said training was interrupted with 50% reporting digital equipment malfunctions. Officers reported there were numerous system "crashes." Observations confirm this fact.

Training execution appeared adequate in that 80% felt that training sessions had enough time. However, 50% of respondents felt the time was used inefficiently and 60% felt the pace of

training was too fast. Additionally, 70% felt there were not enough trainers or "helpers" available to assist the trainees in operating the system. Soldier comments indicate that training time could have been more efficient if more systems and trainers were available and that training time was sufficient for computer literate people. No formal training assessment of acquired knowledge and skills was conducted.

TF SIMUTA Exercise

Training overview. The TF SIMUTA exercises were conducted in the MWSTC (Building 2020 at Fort Knox) and the surrounding environment from 31 March to 2 April. The exercises were conducted by the EXFAC team and MWSTC personnel. The TF-level SIMUTA-based MTC and DIS exercise were conducted on a NTC database. The target audience for this training event included: (a) TF Cdr, (b) four maneuver Cos and the HHC, (c) Scouts, and (d) an externally tasked Engineer Co, ADA Plt, and FA personnel (including two FIST teams and an FSO). Additionally, all TF support and CSS assets were allowed to participate by performing inherent functions outside the simulation activities. All battle staff personnel participated in the event. Following the conclusion of this exercise, three maneuver Cos were scheduled to conduct Co-level SIMNET exercises for two days.

Training goals. The overall goal of this training was to provide an opportunity to rehearse operations planned for later AWE FD sub-experiments VS1, Janus III, VS II, and the Live-Virtual events. The immediate goal was to conduct conventional offensive and defensive TF-level exercises with leaders, battle staff, Cos and crews, and attached BOS elements. The Bn Cdr's emphasis was to primarily work synchronization and timing, reporting, and CSS. The TF CSS assets (including maintenance, medical, signal, chaplain, mess, and other support) were to receive full training in a live simulation (field) training environment. The same SIMUTA-based training approach used in the Janus CPX constructive simulation was utilized for the SIMUTA virtual simulation. Also, the same maneuver and staff tasks were used. The CSS support tasks were played in live simulation with linkages through CTCP and TOC staff via radio.

Training environment. The site layout included MWSTC and external MWSTC field layouts for the (a) TOC, (b) CTCP, (c) unit maintenance collection point (UMCP) and field trains, (d) battalion aid station (BAS), (e) FA, and (f) other CSS support. Inside the MWSTC, the maneuver Cos occupied M1 and Bradley simulators. The B Co/Tm was the only complete Co, i.e., 10 M1 and 4 Bradley simulators. The other three Cos were manned with the appropriate mix of remaining simulators. The HHC and field trains, Mortar Plt, CTCP, TOC, FSO, ADA, Engineer, and UMCP elements interacted via WS as appropriate. The EXFACs monitored the battle through WSs, stealth displays, PVDs, and CB radios. They also monitored Bn personnel by observing their actions during the planning, preparation, and execution phases of the

mission. Battles were recorded using a DataLogger and were available for viewing in a debriefing room. The debriefing room was equipped with a projector and screen for displaying battle movements and slide material.

A field TOC with M577s and tent extensions was erected directly behind the MWSTC. The CTCP, BAS, and UMCP were established in a field behind and to the left of the MWSTC with radio and wire communications to the TOC and TF leaders. The field kitchen, Mortar Plt (including tracked vehicles), and a logistics release point (LRP) were established to the left of the MWSTC. The field trains were established across the road from the front of the MWSTC and were connected via radio and wire telephone communications.

Weather was clear, calm, and cool requiring the field personnel to wear normal uniform with field jackets. Noise distractions were minimal inside and outside the MWSTC. Only CB radio communications were used for transmissions within the MWSTC.

Training execution. The TF received SIMUTA-developed materials and information similar to the ones received in the Janus CPX conducted in February. On 30 March the battle staff conducted their orders process using the SIMUTA materials provided. The TF assembled at the MWSTC to prepare the site at 1600 on 31 March. The Co Cdrs received their OPORD at the same time at the TF 2-33 AR conference room.

Prior to executing offensive or defensive missions, the TF leaders, battle staff, and Co Cdrs conducted a walk-through mission rehearsal in the field behind the MWSTC. Control measures such as phase lines, locations of positions (i.e., assembly areas, battle positions, and pre-planned FS positions) were outlined on the ground with cloth tape and stakes. Red painted enemy equipment models were used to represent the enemy CRP, FSE, and MRB. The S3 led the rehearsal with leaders and staff giving a short description of what they were doing as they rehearsed and refined each phase of the battle they were to conduct.

The TF personnel reported to their assigned simulators or WS and executed the battle. The EXFACs monitored TF personnel and the battle through displays and CB radios. During preparation for and execution of the mission, the EXFACs recorded notes on forms that later allowed them to focus AAR comments. As TF elements were "killed" during the battle, they ceased to participate as TF entities in the virtual battlefield. Crewmembers were given cards designating them as killed or wounded and directed to report to the BAS for treatment and processing. After processing they could return to watch the battle at different WS. During the mission, other supporting elements were given tasks to perform as driven by the scenario. For example, maintainers performed track repairs on tracked

vehicles. The exercise ended when the TF or enemy unit was rendered combat ineffective; a decision made by the senior EXFAC officer. After the mission was over, TF personnel received feedback from the EXFACs.

Training assessment. A formal external AAR was conducted that focused on BOS functions and tasks. In a similar fashion to the Janus CPX, the EXFACs collected performance information on collection forms geared to task execution within each BOS functional area. Key areas on each form were concentrated on C2 and the coordination and dissemination of information. At the conclusion of training, EXFACs responsible for particular BOS functional areas provided "stovepipe" AARs to specific sections they observed. For example, the TOC EXFAC provided feedback privately to the S2 section then the S3 section then the whole TOC. The TOC stovepipe AAR also included comparison to past performance in the Janus CPX exercise to illustrate areas of improvement. After stovepipe AARs had been conducted, the TF assembled in a briefing room where they received an overall AAR from the senior EXFAC officer. The AAR was focused on BOS areas, CA integration, and synchronization on the battlefield. The TF were given a computer-projected, fast-forward version of the battle with stopping points at certain key phases where discussion concentrated on certain relevant points. Summaries and totals of engagements were tallied and presented. Key points and discussion focused on BOS functional integration and synchronization and lessons learned for future improvement. After the EXFACs gave their AAR and left, the Bn Cdr conducted a short AAR with specific guidance given to leaders and staff for improving individual and collective performance.

Summary. Of the 17 respondents, 14 reported participating in this training. Of the 14 reporting, (a) 93% indicated they were proficient in conventional tasks prior to the start of this event, (b) 71% indicated having received orientation training on the simulation, WS, and SW capabilities and limitations prior to event start, and (c) 79% reported having received hands-on practice or experience with the simulation prior to starting this event. All 14 participants indicated training objectives were clear and that they understood the missions, tasks, conditions and standards they were supposed to perform.

For the training environment, 36% reported experiencing training interruptions with three participants indicating poor radio communications being a problem. Over 71% felt the simulated equipment replicated real system HW. Although 64% indicated no equipment and simulation deficiencies or unrealistic simulation, 29% indicated there was a problem from their perspective. Of those responding that there was a problem, comments indicated radio problems, the lack of dismount capability for Scouts, and massive crew casualties overwhelming the medical system which slowed the execution process. As for layout and location interfering with performance, 71% reported no perceived problems. However, 29% did perceive a problem

associated with location. One respondent indicated that CSS could not effectively use FM communications external to the MWSTC to tie into CB radios used in the MWSTC. As for the presence of written materials, 86% reported materials were available.

According to respondents, training was executed well with 86% agreeing training was effective and efficient and that training conformed to appropriate doctrine. Over 71% reported having received orientation training on MWSTC and equipment prior to the start of the event. In addition, 79% reported receiving adequate hands-on practice with the equipment and simulation prior to starting the event.

All but two respondents agreed that (a) training feedback was focused, (b) EXFACs provided valid and credible observations, and (c) lessons learned were identified and helped them in sustaining and improving their performance. One of the comments indicated the Scout Plt mission was inconsistent with doctrine and the EXFAC observations were less credible. One respondent indicated learning many lessons on the personnel tracking system.

VS1

The VS1 was a sub-experiment within the AWE FD. It was scheduled with one week of training on specialized TTPs then two weeks of experimental evaluation of resulting refinement to TTPs. Several TTPs were identified as Alpha and Beta cases for 24 Bn-level and 29 Co-level tasks and sub-tasks. These TTPs were to be validated and refined based on changes introduced through the use of digital equipment and procedures. Prior to the start of the VS1 experiment, it was expected that the TF was proficient in applying conventional collective doctrine, in using digital equipment, and in applying both Alpha and Beta case TTPs. However, due to technical problems with equipment, resource problems with digital equipment, and delays in training, the TF did not have the opportunity to practice Beta cases prior to VS1. It also was not apparent what level of proficiency had been achieved by the TF while training in conventional doctrine and digital applications. Prior to VS1, the TF had trained in several collective events using conventional doctrine without ADA and Engineer elements and with a limited CSS effort. Therefore, most of VS1 could be considered the first attempt of the TF to collectively train with digital equipment across CA assets (minus aviation). For purposes of this report, VS1 is portrayed as TF collective training in preparation for the final Live-Virtual experiment.

Training overview. The VS1 was conducted in the MWTB from 4 to 21 April. The MTC and DIS missions were conducted on an NTC database. The focus of training was on the improvement of the planning, preparation, and execution phases of battle. The target audience for VS1 included: (a) the TF Cdr with Bradley BCV simulator personnel (i.e., BICC and FA NCO); (b) the S3 in a M1A1 BCV simulator; (c) four Co Cdrs and Scouts in M1 simulators;

(d) C2V battle staff personnel, i.e., XO, S3 Air, S2, and FSO; (e) CTCP battle staff personnel, i.e., S1, S4, BMO, and Medical PL; (f) a secondary CP with a Chemical Officer with S3 staff NCOs and specialists; (g) Engineer asset co-located with CTCP personnel; (h) an ADA PL; (i) and FA assets, i.e., Co FIST.

Training goals. Original planned training for the TF included specific training for individuals and crews to operate in the MWTB environment. Training was planned for (a) orientation of differences between the MWTB simulation and simulators versus other simulations and actual vehicles and (b) specific digital C2 equipment training. At the collective level, training was to occur for a TF slice with staff, command, CS, and CSS elements. Training was to included planning, preparing, and executing MTC and DIS missions. Also, plans included training on Alpha cases as a minimum goal. The TF Cdr's intent for training was to develop the digital orders process for the TF and develop digital techniques to accelerate the battle staff planning, preparation, and execution process.

Training environment. All training was conducted within the MWTB. The TF personnel operated modified M1 and Bradley simulators, stand-alone WS, and digital equipment assets, i.e., IVIS, B2C2, ASAS, and IFSAS. Two Co Cdrs, three FISTs, both Scouts, the S3, and their crews occupied M1 simulators. Two Co/Tm Cdrs, TF Cdr, and crews used M2 simulators. A TOC C2V shell was equipped with simulated FM (CB equipment) for voice communication and the four primary digital C2 systems. These systems included (a) a digital FSO station (IFSAS) operated by the TF FSO, (b) battlefield intelligence station (ASAS) operated by the S2, and (c) a battle command station (B2C2, and IVIS) operated by the S3 Air and assistant. The XO directed the staff and plotted locations on a map board located behind the battle command station area. A CTCP tent area (behind the C2V) included an IVIS and B2C2 for CSS personnel and Engineer. A secondary CP tent, located in a classroom near the simulator bay, contained a B2C2 and CB and was manned by the TF Chemical Officer, S3 staff NCOs, and specialists for planning future battle operations. A separate Bde cell was co-located with friendly modular SAFOR (MODSAF) controllers, the fourth Co Cdr and his FIST, and ADA PL. The fourth Co Cdr, his FIST, and the ADA PL had a stealth screen to view the battle and CBs for simulated FM, an IVIS (for the Co Cdr), and a WS (for the ADA PL). The EXFACs were co-located with the OPFOR controllers and had digital and video equipment for monitoring the TF Cdr, his digital assets, and all TF radio nets.

The SINCGARS was simulated using a SINCGARS Radio Model (SRM) that duplicated real world signal drop-off with distance. The IVIS systems (using SW version 2.3.2) ran through a radio interface unit (RIU) over the SRM network but lacked POSNAV capability and far target designation functionality. In addition, unlike the actual IVIS which uses a thumb cursor on the control stick and a displayed keyboard menu for text/number input, keyboards were available for inputting text and number

information. The B2C2 used version 3.5 SW (instead of version 3.4 used previously). All B2C2 assets were hardwired to each other so no interface with other digital equipment was possible. The two ASAS systems located at the Bde cell and the C2V TOC were hardwired for communication with each other. The IFSAS system was partially interfaced through the SRM for the FISTs and TF Cdr while the C2V and Bde IFSAS were hardwired together. The IVIS and IFSAS had no voice contention over the SRM unlike real world systems.

Digital equipment problems, especially for the primary C2 systems, were numerous throughout VS1. The IVISs were essentially non-functional throughout the first week. The IVISs became progressively functional as the SRM and IVIS were improved and as the TF personnel learned the limitations of the systems. The B2C2 experienced numerous crashes throughout VS1 but workarounds were developed that eliminated the frequency of crashes, i.e., limiting the amount of graphics input into overlays.

Various Army agencies and contractors were present in the MWTB operations area which sometimes resulted in crowded conditions for the TF participants. The EXFACs were sometimes present inside simulators, the C2V shell, the CTCP, and Bde cell area to monitor and collect data. Background noise from radios and human voices was present in some areas such as the Bde cell where SAFOR operators, Bde staff, and TF personnel were in close proximity. The MWTB environmental conditions were relatively comfortable but crowded conditions with digital equipment (i.e., the C2V shell) sometimes resulted in uncomfortably warm conditions for TF participants.

Training execution. Prior to VS1, the TF had received materials about Alpha and Beta case TTPs from MBBL. However, the TF had little opportunity or resources to practice any of the TTPs in preparation for the sub-experiment. During VS1, the TF "trained" on the TTPs as they executed the DIS and MTC missions. Changes and refinements were made to TTPs as the TF executed them in each successive mission.

Observations were that no formal individual or crew training was conducted. No training was provided for orienting participants to differences between simulators, simulations, and actual equipment, digital equipment (i.e., IVIS or B2C2), or SAFOR operations and control with tethering. Individuals and crews received assistance from technical specialists and support personnel as problems occurred.

Prior to VS1, the TF had received Bde OPORDS for both missions for planning purposes. Prior to VS1, TF collective training was oriented on training in two phases: the planning and preparation phase and the preparation and execution phase. Due to the experiment's goal of providing a standardized approach to collecting data, the mission preparation and execution phase

was always conducted first - a phase similar to the SIMUTA-based approach used in the MWSTC and Janus 1 training events mentioned earlier. In this phase, the TF further refined paper-based Bn orders, control measures, synchronization matrix, COA, and mission plans. Since digital copies of these documents were not available, the TF personnel had to manually input overlays, control measures, warning order files, and other information into the digital systems for use in execution. Prior to execution, the TF leaders and staff conducted a digital mission rehearsal in simulators using simulated FM voice and digital systems (when operable). During the digital rehearsal, the TF participants conducted digital and voice interconnectivity checks then practiced sending and relaying reports and messages via digital systems or voice at appropriate phases of the battle. While executing the mission, the TF attempted to send digital overlays and reports to conduct combat operations. If radio systems were failing, extra TF personnel served as couriers to verify receipt of information. If information was sent and not received, the couriers delivered hand-drawn maps, overlays, and messages of sent materials to receivers in order to keep the information flow moving. The EXFACs examined materials for their data collection notes to verify what was intended to be sent digitally or by voice. The end of the mission exercise occurred when the TF or OPFOR was rendered combat ineffective (as judged by the senior EXFAC officer) or the OPFOR bypassed or penetrated TF defensive positions. The TF AARs were conducted usually the next morning by the senior EXFAC.

Planning and preparation phases were conducted after the mission execution wherein the TF Cdr conducted an internal AAR and set the daily intent and purpose of the planning and preparation process. Primarily, the TF had the opportunity to review the battle with the Cdr and plan how they would conduct it if they were to do it over again. During this phase, TF staff concentrated on (a) developing and refining the digital orders process, (b) troop leading procedures, (c) parallel planning and preparation process, (d) battle tracking process, (e) task resource and synchronization matrix, and (f) tactical SOP (TACSOP). The EXFAC and external TF elements (other than ARI personnel) usually did not attend this phase of training.

Training assessment. The EXFAC personnel were primarily in an observation and data collection role for VS1 purposes. As mentioned by their senior officer, most EXFAC personnel had received no previous training on the digital systems. Observations and data on operations by a digital TF and Co/Tm were collected based on TTP information contained in a special texts (STs), ST 71-1-1, Tactics and techniques for the Digitized Company Team (U.S. Army Armor School, 1995b) and ST 71-2-2, Tactics and Techniques for the Digitized Battalion Task Force (U.S. Army Armor School, 1995c). Physical observation was limited to some over-the-shoulder monitoring (i.e., the C2V) or to examining hand-written overlays and communications between TF elements. Unobtrusive observations were conducted at the Bde

cell and at the EXFAC station. These stations contained (a) radios for monitoring voice communications, (b) digital equipment for monitoring the TF Cdr's BCV transmissions and receptions, (c) video monitors for monitoring inside the C2V, and (d) stealth displays and PVDs for monitoring the battlefield. Data collection forms geared to mission scenarios were used to make detailed notes about TF operations. A DataLogger captured automated data from the simulation network. DataLogger information included times, indirect and direct firing information, kill information, and other TF and OPFOR information.

Formal AARs were conducted usually the morning of the next day which gave the EXFACs time to assemble, collate, and review automated and manually collected information. The senior EXFAC officer conducted the AAR concentrating on the following areas: (a) BOS functional areas; (b) TF conduct of synchronized activities; (c) TF digital operations; (d) TF compliance with tactics and techniques mentioned in STs 71-1-1 and 71-2-2; (e) TF products, i.e., resource task matrix for synchronizing responsibilities of positions, actions taken, when actions occur, and product of action; (f) TTP refinements; and (g) lessons learned for improving the next iteration of the mission. After the EXFAC personnel and observers left the room, the TF Cdr conducted his own AAR with directions for improving individual and collective efforts.

Summary. Of the 17 respondents, 14 attended this training event. Of the respondents, one Co Cdr, the Mortar PL, and a Scout PL indicated they did not participate in this event. (One respondent attended but did not complete the questionnaire resulting in a total of 13 respondents.) All 13 reported they were proficient in conventional tasks and doctrine prior to training in this event. All reported training as a member of a digitally linked team. Eleven (85%) of the respondents reported training objectives (including mission, tasks, conditions, and performance standards) were clear. Based on observations, it is thought the respondents were referring to the daily objectives set forth by the TF Cdr.

For the training environment, 77% reported the simulated equipment did not replicate the actual system HW or SW. Soldiers attributed problems to an intermittent non-functional SRM, a non-functional IVIS, and the differences between the simulator IVIS and the actual IVIS. Also, 77% reported that equipment and simulation deficiencies or realism hindered their performance. Soldiers attributed hindrances to SW problems, inoperability of IVIS or the SRM, and simulating tasks they should have been able to perform with the equipment. All reported their training was interrupted. Some soldier comments attributed interruptions to SRM breakdowns, IVIS inoperability, and simulator crashes. Seven respondents (54%) indicated equipment layout and locations hindered their performance. Three separate soldier comments referred to the CTCP area as a problem. Another soldier stated

that the "BCV setup crippled training to create TTPs in the BCV." One other comment indicated "cramped" conditions due to breakdowns and the interruptions posed by technicians in the area. Ten respondents (77%) indicated written materials such as technical manuals, doctrinal references, and handouts were available. One respondent indicated the written materials were received one week prior to VS1.

Training execution received a mixed rating from respondents. Just over half the respondents (54%) reported receiving any orientation on the limitations and capabilities of simulators, WSs, the simulation, and the SW prior to starting this event. It is surprising that any of the respondents reported receiving any orientation given that no formal training occurred for this event. Possibly, some respondents received orientations during previous MWTB experiments or may have received informal training or information from contractors or MWTB personnel prior to starting the sub-experiment evaluations. Eight respondents (62%) reported receiving adequate hands-on practice with the equipment, simulators, and simulation. Over 84% of the respondents indicated the training conformed to doctrine where appropriate. This rating was not surprising given the adherence to using the TTPs derived from the special texts, ST 71-1-1 and ST 71-2-2. Overall, training was not considered effective or efficient by 69% of the respondents. Soldier comments indicated equipment, SW, SRM, and interface problems hindered training with time wasted in waiting for repairs. One comment indicated "no training was provided by the test director" which confirmed previous observations made in descriptions of the training execution for VS1.

Most of the respondents felt training assessment was valuable and assisted in improving their performance. Ten of the 13 respondents (77%) thought the evaluators provided credible and valid observations. Over 92% of the respondents (12 respondents) indicated that feedback was focused on the training objectives, on meeting standards, and on the link to the mission and essential mission tasks. Eleven respondents (85%) felt lessons learned were identified and helpful in sustaining and improving their performance. Almost all soldier comments (5 of 7 comments) across the three questions were from soldiers with dissenting opinions. These soldiers indicated they thought the feedback was focused on non-digital instead of digital operations.

Bn Slice FTX

Training overview. The TF conducted the Bn slice FTX from 25 to 28 April. This timeframe included the preparation for training until the final AAR. The exercise was controlled from the TF DLC, where a simulated C2V TOC directed the DIS mission exercise for the B Co/Tm located in Fort Knox training areas 8, 9, and 10. The target audience for this training included: (a) Bn Cdr; (b) S3; (c) C2V TOC staff, i.e., the S2, S3 Air, S3 Air assistant, and FSO SMEs from the Artillery School; (d) S1; (e)

S4; (f) Engineers; (g) B Co/Tm including the Co Cdr, his XO, FIST, 1SG, and infantry PL; (h) HHC Cdr with a 1SG and support personnel; and (i) Scouts. No ADA or aviation assets were available for CA participation. The B Co/Tm maneuvered against an OPFOR during the conduct of the exercise. The OPFOR consisted of D Co/Tm using visually modified vehicles.

Training goals. The training goal was to conduct a FTX using digital equipment in a live simulation setting. Training objectives included: (a) refining proposed TTPs for digitized force employment, (b) refining the current TACSOP, and (c) training and refining functional employment of associated digital systems at individual and collective levels.

Training environment. The DLC was used as the C2V TOC for the exercise. In the DLC where the WS were located, the TF had built a worktable area simulating the same approximate dimensional layout as seen in the C2V shell. The simulated C2V shell layout included (from left to right) (a) an IFSAS fire control station, (b) the ASAS intelligence station, and (c) a B2C2 and stand-alone IVIS for the TF C2 station. A tent frame was modified to provide the general outline of the C2V shell with camouflage net draped over the tent frame to enclose the area. The Bn FSO (with SMEs from the Artillery School on standby) operated the IFSAS. The Bn S2 operated the ASAS WS. The S3 Air operated the IVIS and supervised a specialist on the B2C2. Located on the classroom side was a Bde cell with a B2C2 with SINCGARS and a stand-alone ASAS.

The IFSAS, IVIS, and B2C2 were connected to SINCGARS radios for transmissions to and from the field. The ASAS only communicated with the Bde cell ASAS. The IVIS, B2C2, and ASAS used an NTC database. The B2C2 and IVIS in the field setting at local training areas 8, 9, and 10 also used an NTC database. Paper maps of local training areas 8, 9, and 10 served as the main tracking map for the TOC as well as the maneuver Co/Tm. Because there was no digital map of the local training area, all coordinates were interpolated manually into the NTC digital database for drawing overlays and laying in control measures on C2 digital equipment. The B2C2 operated on SW version 3.5 and IVIS operated on SW version 2.3.2.

Local training areas 8, 9, and 10 were located about 8 kilometers from the DLC. The S3 had an M1A2 BCV. The B Co/Tm had (a) 10 M1A2s and 4 M2A2+s equipped with IVIS, (b) an M113 equipped with a B2C2 (manned by the 1SG), and (c) a FIST HMMWV equipped with a Forward Entry Device (FED) for artillery support. The CTCP and field trains had an M109 van with B2C2 for CSS support. The digitized Mortar Plt was located in St. Johns motor pool nearby for the purpose of responding to TF indirect fire requests. The Bde cell, manned with additional S3 shop personnel, used its B2C2 to conduct digital messages with the B Co/Tm 1SG and the HHC field trains van. The IFSAS communicated with the B Co/Tm FIST and also transmitted on the IVIS TACFIRE

net. All had FM voice capability with SINCGARS radios. The Engineers had bulldozing equipment to practice mobility and countermobility operations and used FM radio to communicate with the Co/Tm.

The D Co/Tm served as the OPFOR and had nine visually modified armored vehicles, i.e., two Russian amphibious armored infantry combat vehicle (BMPs) and seven T-72 tanks. They were controlled by the Bn S2 during the DIS mission. Both the B Co/Tm vehicles and the OPFOR vehicle were equipped with MILES devices for conducting force-on-force maneuver. Both Co Cdrs had MILES "god guns" and green keys for disabling and returning "killed" vehicles to life, respectively.

Training execution. The training strategy for this event was to: (a) conduct individual training by BOS, (b) integrate individual tasks into lane training, (c) synchronize BOS tasks into the orders process, and (d) conduct multi-echelon training in a DIS exercise. The TF conducted training over a four-day schedule. The first day was devoted to setup of equipment, conducting communication checks with B Co/Tm, and conducting individual training on equipment. The second day consisted of (a) ensuring communication checks between B Co/Tm and all other digital elements, (b) conducting preparations for battle staff training, (c) receiving the mission, and (d) conducting the digital orders process for planning and preparation phases of the battle, i.e., performing the troop leading procedures and inputting digital overlays, warning orders, and accompanying graphics. Leader's reconnaissance was performed that night and input into the plan for final revisions.

On the third day, the plan was completed and an orders brief was conducted for battle staff, B Co/Tm Cdr, and support elements. Following the briefing, the TF elements prepared to conduct a rehearsal, and defend by 1700 hours that evening. During this time, digital equipment troubleshooting was performed between the TOC and field elements. The IVIS presented few problems but the B2C2 system and IFSAS had communication problems throughout the day. (The Communications and Electronics Signal Officer (CESO) indicated the problems were due to a lack of training, and inadequate documentation on troubleshooting procedures with all the digital systems. Specific problems with B2C2 involved initialization using the NTC database designations versus local map designations.)

Prior to starting the DIS mission exercise, the TF Cdr directed the TOC to maximize digital communication and minimize voice communications. Also, during preparations that morning, he directed the TOC to periodically send sample intelligence information on B2C2 overlays to the B Co/Tm 1SG to see if the Co used the information.

The DIS exercise was conducted during the morning and early afternoon of the fourth day. (Since direct observation was not

possible, all information for the field portion of the exercise came from monitoring TOC operations, interviews with personnel, and from the AAR.) Since the OPFOR had only nine vehicles, the OPFOR Co Cdr was allowed to re-key MILES (after they were "killed") on some vehicles to simulate 15 total OPFOR vehicles during the attack. No external O/Cs were used. The Co Cdrs served as their own umpires and O/Cs. The total exercise lasted about 4 hours.

During the mission, there were some digital breakdowns that affected different participants. For example, the S4 was unable to participate digitally throughout most of the exercise because his B2C2 was not functioning. The C2V TOC IVIS had to be re-initialized every 30 minutes because it went to a dead status due to the absence of POSNAV movement inputs to system. The IFSAS worked well with Call for Fire (CFF) reports being received from IVIS.

Training assessment. Informal stovepipe AARs were conducted on-site by chain of command personnel after the end of the exercise. A formal internal AAR was conducted in the TF HQ the following afternoon. The TF S3 conducted the AAR with the TF Cdr present. All leaders including PLs, battle staff, senior NCOs, and support personnel leaders were present. The focus for the AAR was on the TF-level issues although the exercise was conducted similarly to a Co-level FTX. The AAR proceeded with the OPFOR Co Cdr presentation of events followed by the B Co/Tm Cdr's version of events with each participant given the opportunity to review and discuss their actions. Input was given by the Co Cdrs, the S3, and the TF Cdr. After the discussion, each BOS element presented a review of key strengths, and discussed what should be sustained and improved for future operations. Upon conclusion of the AAR, the TF Cdr reminded the participants to review ST 71-1-1 and 71-2-2 and make changes based on experiences. He also tasked the leaders and staff to conduct a digital COMMEX to identify the reasons for digital communication problems and fix them before conducting the next FTX.

Summary. Prior to start of the FTX mission, several soldiers made remarks about their first use of digital systems in a live simulation setting. The IFSAS operator in the TOC (Bn FSO) mentioned that he was not trained on the IFSAS prior to VS1. He also stated that this exercise provided his first opportunity to practice hands-on learning with the real equipment in a live simulation setting. Also, the S3 Air and his assistant said it was their first opportunity to practice with IVIS and B2C2, respectively, in a live simulation setting.

Of 17 respondents, 12 participated in this event. Of the 12 participants, nine reported training as a member of a digitally linked team. Those reporting training as digitally linked team members were: (a) TF Cdr, (b) S3, (c) S3 Air, (d) S2, (e) S4, (f) B Co/Tm Cdr, (g) HHC Cdr, (h) Mortar PL, and (i) Chemical

Officer. Eleven respondents (93%) reported being proficient in conventional tasks and doctrine before the start of this event. Most of the respondents (83%) reported that the training objectives (including mission, tasks, conditions, and performance standards) were clear.

For the training environment, 50% of respondents reported training was interrupted and that equipment deficiencies hindered their performance. Soldier comments specifically referred to equipment problems but also included comments about limitations imposed by missing ASAS connectivity, lack of a C2V, and the range of B2C2. The only positive comment indicated that the FTX provided an opportunity to develop workarounds, TTPs, and "how tos." Approximately 58% of respondents indicated SW deficiencies hindered their performance during the FTX. Almost all the soldier comments attributed the deficiency to the use of the electronic NTC terrain database or lack of an electronic Fort Knox terrain database. Written materials were available according to 67% of the respondents. One comment indicated conventional doctrine materials were available but digital doctrine materials were not available. Another comment indicated that the TF personnel were creating the written documentation for operating and using digital systems as they performed in this event. Observations and interviews during the event indicated the latter comment was true. A need was identified for troubleshooting guides for digital equipment.

Training execution was reportedly done well with 67% reporting receiving adequate hands-on practice prior to the start of the event. Of the respondents, 75% reported training conformed to doctrine where appropriate.

Training assessment was performed internally by TF personnel although only 67% indicated so in their rating. Only 33% thought the evaluators provided valid and credible observations with 50% of possible respondents not responding or responding "not applicable" to this particular question. However, 67% of respondents indicated the feedback received was focused on training objectives, meeting standards, and linked to mission and essential mission tasks. All but one respondent (92%) indicated lessons learned were identified and were helpful in sustaining and improving performance.

Digital COMMEX

Training overview. As a follow on to the TF Cdr's tasking during the previous Bn slice FTX event, selected members of the TF conducted a digital COMMEX on 4 May. The training audience included: (a) TF Cdr; (b) S3; (c) C2V TOC personnel, i.e., S3 Air, BICC, and an S3 NCO; (d) three Co Cdrs; (e) HHC Cdr; (f) B Co/Tm 1SG; and (g) support personnel to fill in for CSS elements in a CTCP.

Training goals. The training goal was to conduct an exercise with fewer personnel to solve IVIS and B2C2 digital equipment problems, identify solutions, and refine TTPS and TACSOP.

Training environment. The DLC served as the C2V TOC. The DLC contained the same layout as used in the Bn slice FTX conducted the week before. The S3 Air operated the IVIS, the BICC operated the ASAS (in stand-alone mode), and an operations NCO operated the B2C2. The A, B, and C Co Cdrs occupied M1A2s in a nearby motor pool to provide exercise support with IVIS. The B Co/Tm 1SG operated a B2C2 at the motor pool. The HHC Cdr operated a B2C2 at a nearby (undisclosed) location. The fourth B2C2 was setup as a remote CTCP node.

Training execution. The same DIS mission conducted the week before in the Bn slice FTX served as the scenario driver for this exercise. Overlays and messages geared to the scenario drove the digital communications among the different nodes. Originally the exercise was designed to last two hours but the participants spent 1 1/2 hours conducting communications checks before conducting the COMMEX.

Training assessment. Training evaluation was not a primary concern for this exercise. Fixing equipment and operations and improving procedures were the primary reasons for conducting this event. No training feedback was observed.

Summary. Eight of 17 respondents indicated they participated in this exercise. Respondents indicating participation included the (a) TF Cdr, (b) S3, (c) S3 Air, (d) BICC, (e) A, B, and C Co Cdrs, and (f) HHC Cdr. Of these participants, the TF Cdr and BICC did not participate digitally. The BICC did not participate digitally with other members of the TF because the ASAS was in stand-alone mode with no connections to another ASAS. Seven indicated they were proficient in the digital equipment operations prior to the start of the exercise. Five respondents (63%) indicated training objectives were clear.

With regard to the training environment, 38% reported training interruptions. Only 25% reported digital equipment deficiencies hindered their performance. Only 38% reported SW deficiencies hindered their performance. The indication from soldier comments was that the inappropriate electronic NTC terrain database interfered with their performance. Six respondents (75%) reported that written materials were available for use.

For training execution, 63% of respondents indicated they had already received orientation about equipment and SW limitations and capabilities. Also, 63% indicated they had received adequate hands-on practice with the equipment before this event. When asked whether training conformed to doctrine

where appropriate, 50% of respondents indicated training did and 25% indicated training did not.

It would appear that respondents were confused about the nature of the training feedback. Four respondents indicated TF personnel did not serve as evaluators while two respondents thought there were TF evaluators. As to the validity and credibility of observations made by evaluators, 63% of respondents did not answer or reported "not applicable" as a response. Also, 63% failed to respond or reported "not applicable" when asked to respond to whether the feedback focused on training objectives, standards, missions, and mission essential tasks. It is possible respondents were confused about the training nature of this event or did not clearly recall the event. However, 50% of respondents reported lessons learned were identified and helpful in sustaining and improving performance. This last rating is not surprising given that the training purpose was to identify and fix digital equipment problems and procedures.

Janus III

Training overview. Janus III was an AWE FD sub-experiment using constructive simulation to explore the effects of digital equipment on intelligence and battle staff functions. The event was conducted from 22 May to 2 June in the same Janus facility described previously in the Janus CPX training event. All three mission scenarios (i.e., DIS, MTC, and for the first time a DATK scenario) were employed throughout the sub-experiment. (Observations during this sub-experiment and training event were limited to the 30 May through 2 Jun.) The training audience for this event included: (a) TF Cdr; (b) TF battle staff; (c) some Co Cdrs; (d) Scouts; (e) Fire Support personnel including mortar and field artillery personnel; (f) CSS personnel including S1, S4, and HHC Cdr; and (g) an ADA element.

Training goals. The training goals and purposes were similar to the training goals and trained functional tasks cited earlier in the Janus CPX event. However, unlike the previous CPX, Janus III was a "digital" full leader CPX. The differences in this event were that (a) it was externally driven as a sub-experiment, (b) the TF conducted DATK missions in addition to MTC and DIS missions, and (c) digital equipment was used or emulated to discover the effects it had on TF CP offensive and defensive operations.

Training environment. As before in the Janus CPX, the TF elements were located in the same configurations within the two different exercise rooms. However, the simulated C2V TOC and other locations, where TF staff, support elements, and Cdrs were located, contained TF digital equipment and enhanced Janus terminals running Janus SW version 4.1X. The enhanced Janus terminals provided the TF leaders with an enhanced situational awareness capability beyond the normal IVIS capability. Trained

TF personnel served as "pucksters" to operate the Janus terminals for TF staff and Cdrs. B2C2 equipment was hardwired as a local area network. The ASAS in the C2V TOC simulation was hardwired to the Bde cell ASAS terminal. The IFSAS and other fire control digital equipment were hardwired together.

Layout of digital equipment included: (a) the simulated C2V TOC with B2C2, ASAS, IFSAS, and Janus terminal; (b) CTCP with B2C2; (c) HHC field trains CP with B2C2; (d) B Co/Tm 1SG with B2C2 and Janus terminal; (e) S3 and Engineers shared B2C2 and a Janus terminal; (f) TF Cdr's simulated BCV with B2C2 and Janus terminal; (g) Mortar Plt with IFSAS and fire control digital equipment; and (h) the Bde cell with B2C2, IFSAS, and ASAS. Other than the Janus terminals, none of the digital equipment had electronic linkage or interface to the Janus simulation. All had radios for FM voice communications.

The Janus terminal and the ASAS WS contained the WKTA terrain database where all three scenarios could be conducted. In addition, the Janus enhanced terminal contained several features and functions that were much more robust than the real IVIS. For example, the Janus terminal had (a) a large color PVD display of terrain and vehicle icon movement, (b) a function to depict the enemy range and LOS capabilities, and (c) a terrain analysis function for conducting terrain reconnaissance. The B2C2 contained the NTC terrain database which greatly curtailed its ability to be used realistically for TF C2. The C2V TOC digital equipment layout was not like the actual C2V TOC and previously simulated shell layouts used in VS1 and the DLC. The equipment order and distance between the equipment prevented the staff from conducting the operations according to their normal arrangement. Similarly, the simulated BCVs were not completely equipped or setup in the layout used in the real BCVs.

Compared to the previous Janus CPX, seating and space was not a problem. However, background noise from radio communications and personnel added to distractions during training execution.

Training execution. Observations were limited to a MTC mission including planning, preparation, execution, and subsequent AAR. As before, contractors and the EXFAC team were available to support training. The EXFACs performed both data collection and evaluator roles for the TF.

Once the Bde order was received, the schedule of events for the MTC mission was to conduct planning and preparation for the mission one day, execute the mission the following day, and have a TF AAR conducted by the EXFACs on the subsequent day. Since the TF had obviously conducted this mission before, planning time was shortened. More emphasis was placed on exploring the preparation for battle using the robust functions of the Janus terminal.

Prior to executing the mission, two different types of rehearsals were conducted. The first rehearsal was a conventional on-the-ground walk through Level I rehearsal described in ST 71-2-2 (U.S. Army Armor School, 1995c). The TF leaders and staff conducted a walk-through mission rehearsal in the hallway between the two rooms. Control measures such as phase lines and locations of positions (i.e., assembly areas, battle positions, pre-planned FS positions, etc.) were outlined on the floor with tape. Red painted enemy equipment models were used to represent the enemy CRP, FSE, and MRB. The S3 read the Warning order and led the rehearsal. Leaders and staff gave a short description of what they were doing as they rehearsed and refined each phase of the battle they were to conduct.

After conducting this rehearsal, the TF conducted a Level IV modified digital rehearsal using the Janus terminal. According to ST 71-2-2, the Level IV rehearsal includes: (a) real-time maneuver over actual or similar terrain; (b) designating far targets; (c) preparing and sending automated reports; and (d) initiating battle drills based on information displayed on automated tactical displays. The main focus of the observed rehearsal was to use Janus tools (through the Janus terminal) for conducting the wargaming and developing COAs. During the rehearsal, there was no observed play of information flow to synchronize digital reporting process between TF elements. Using the Janus constructive simulation, the TF conducted a wargame to the point of identifying the FSE. At this point they froze the simulation, and started the wargaming process. As part of the process, the TF C2V staff and S3: (a) examined what the enemy could and could not observe using the Janus terminal LOS tools for each enemy element's weapon system; (b) selected targets for priority of fires based on which enemy could see their avenue of approach (including conditions with use of high explosive rounds and smoke); (c) examined direct fire positions where they could shoot from outside the enemy's weapon system ranges; (d) planned avenues of approach where they could maneuver behind terrain and smoke; and (e) planned field artillery, mortar, and ADA support.

Upon completion of the process, the TF Cdr was briefed by the staff on their discoveries. He then instructed them to send a fragmentary order (FRAGO) and a simplified digital whiteboard graphic of upcoming "play" (i.e., like a football playbook sketch) to him on his Janus terminal so he could review before issuing the FRAGO to the TF. The staff moved with him to his Janus terminal and reviewed the text and graphics portrayed on his screen. After answering the TF Cdr's questions to his satisfaction, a FRAGO was issued and the wargame was resumed. The rehearsal was stopped short of completion so the TF had time to execute the MTC mission.

For MTC mission execution, the TF personnel reported to their stations and executed the battle. The EXFAC team observed the TF personnel during the battle and recorded data and notes on forms that later allowed them to focus AAR comments. As TF

elements were "killed" during the battle, they ceased to participate as TF entities on the constructive battlefield. The exercise ended when the TF or enemy unit was rendered combat ineffective; a decision made by the senior EXFAC.

Training assessment. A TF AAR was conducted by the senior EXFAC officer in a large briefing room. The focus of the AAR was on (a) digital rehearsal, (b) integration of the digital equipment, (c) C2, and (d) integration and synchronization of the battle with BOS elements. The TF received a computer-projected, fast-forward version of the battle with stopping points at certain key phases where discussion concentrated on certain relevant points. Summaries and totals of engagements were tallied and presented. Key points and discussion included: (a) discussion of the use of the Janus tools as a warfighting rehearsal tool for "fighting the fight" beforehand, (b) BOS functional integration and synchronization, (c) lessons learned and TTP refinements to digital C2, and (d) each TF member's key sustain and improve category for future performance.

Summary. Of the 17 respondents, 13 (76%) reported participating in this training event. Twelve of the participants reported participating as a member of a digitally linked team. The BICC was the only participant without direct digital equipment access. All 13 participants indicated they were proficient in conventional doctrine and tasks before using digital equipment in this event. The training objectives were clear according to 92% of the respondents.

For the training environment, 62% reported training was interrupted. Soldier comments indicated the Janus simulation crashed or had breakdowns. Although observations and soldier comments indicated equipment layout and locations were not in accordance with the way digital equipment is arrayed in TF C2 vehicles or as in previous training, 62% of respondents did not indicate performance being hindered by the layouts. Three of five soldier comments indicated the C2V or BCV layouts did not replicate the real layouts. Only 46% indicated the simulated equipment (i.e., IVIS) adequately replicated the real system HW and SW. However, 85% indicated that equipment and simulation deficiencies or realism did not hinder their performance. The latter rating was not surprising given that the IVIS was much more robust with Janus functions allowing the soldiers a chance to enhance performance. Over 76% of respondents indicated written materials were available for assisting training.

According to 92% of respondents, training execution was effective and efficient. All respondents indicated training conformed to doctrine where appropriate. However, not all training execution went well. Only 54% of respondents indicated receiving orientation training that identified the limitations and capabilities of the simulation, WSs, and SW prior to starting the event. In fact, soldier comments indicate that lack of information regarding system capabilities and limitations either

hurt their performance or delayed their understanding of the system until learning it after the midpoint of the event. Surprisingly, 62% indicated they received adequate hands on practice with the equipment and simulation prior to the start of the training event. Most of the respondents that used the Janus terminals rated this question affirmatively despite the fact they had trained TF "pucksters" that operated the equipment for them. One comment summarized the dissenting raters' opinions in stating "only operators were trained, leaders needed the training."

The majority of respondents rated training feedback as effective. All respondents thought feedback was focused on training objectives, meeting standards, mission, and mission essential tasks. All but one respondent thought the EXFAC provided valid and credible observations and thought lessons learned were identified and helpful for sustaining and improving performance. The only complaint made across all three training assessment questions was the theme that the feedback was inadequate for digital operations.

TF FTX

Training overview. The TF conducted a FTX during the week of 12 through 17 June at Fort Knox local training areas. Target audience for this event included the whole TF with supporting BOS elements. One Co played the role of OPFOR during the FTX. Training was only observed on one evening after the first mission was completed.

Training goals. The training goal was to conduct a TF FTX with digital C2 vehicles and digital equipment using force-on-force maneuver with MILES equipment.

Training environment. The TF conducted operations in local training areas 8, 9, and 10. Three of four C2 vehicles were available for controlling the TF: (a) a C2V used for the TOC, (b) a C2V used for the CTCP, and (c) a M1A1 BCV used by the S3. The TOC C2V contained the IFSAS, ASAS WS, B2C2, and IVIS. Each station was manned respectively by an FS NCO (Artillery School SME), the S2, an S3 Air assistant, and the S3 Air. The XO stood behind the stations in overwatch manning a map board. The CTCP C2V contained the S1 and S4 with assistants for each officer. The S1 and S4 operated B2C2s and assistants manned radios for voice communications. The S3 BCV was commanded by the S3 and contained an IVIS and B2C2. The B Co/Tm had its full complement of M1A2s and M2A2+s present for conducting digital operations. A and C Co Cdrs used M1A2s to participate digitally.

A Bde cell was configured with ASAS, IFSAS, IVIS, and B2C2 for interacting with the TF. It was manned by TF personnel and some contractor personnel. Additionally, a Paladin was available for conducting simulated fire missions and for interfacing with various fire control assets. The ASAS equipment was unable to play digitally because no linkage was available between the C2V

play digitally because no linkage was available between the C2V and Bde. Weather was clear and warm for the four days of field training.

Training execution. On 12 June the TF sent personnel to prepare the area for receiving the TF. On 13 June, the TF (a) conducted a tactical road march to the area over most of the daylight hours, (b) started the planning and preparation process for a DIS mission, (c) conducted reconnaissance starting in the late afternoon, and (d) conducted an orders brief starting at 1800 hours.

On 14 June, preparations to defend started at 0000 hours and lasted until 1200 hours. The DIS mission execution started at 1200 with consolidation and reorganization activities slated for two hours after the mission execution was finished. An AAR was scheduled to occur after reorganization activities were completed.

On 15 June, a MTC mission was conducted during midday followed by consolidation and reorganization phases of the battle. An AAR was scheduled for late evening around 1900 hours. During observation that afternoon, it was mentioned the ADA and Engineers did not play digitally in the MTC mission. The following day the TF conducted a tactical road march back to post and conducted post operations and maintenance activities on equipment.

Training assessment. Training assessment was done internally by the TF with the AAR conducted by the TF Cdr. Force-on-force maneuver was conducted with MILES equipment. The BICC served in an O/C role for the OPFOR but it was unknown who served in an O/C role(s) for the TF.

Summary. Fourteen of 17 respondents indicated participating in this event. Eleven of the 14 reported training as a member of a digitally linked team which included the following respondents: (a) XO; (b) S3; (c) S2; (d) S3 Air; (e) S4; (f) Chemical Officer; (g) A, B, C, and HHC Cdrs; and (h) Mortar PL. All but one respondent reported being proficient in conventional doctrine before training with digital equipment in this event. Over 85% of respondents indicated the training objectives were clear for this event.

As for training environment ratings, only 29% indicated training was interrupted or that equipment deficiencies hindered their performance. However, 50% of respondents indicated SW problems hindered their performance. All five comments attributed the SW problem to a lack of a Fort Knox terrain database for digital equipment, especially for ASAS and B2C2. Nine respondents (64%) indicated written materials were available.

For training execution, 64% indicated they had received orientation training on limitations and capabilities of the equipment and SW prior to executing the event. Eight respondents (54%) indicated receiving enough hands-on practice with the vehicles and digital equipment prior to the start of the event. Two soldier comments referenced the C2V. One soldier indicated it was the first time for one to train in the vehicle. Another soldier related no training on C2V had been received yet. (C2V vehicle operations training was scheduled for the following week.) All 12 respondents to this question indicated training conformed to doctrine where appropriate; two respondents did not answer this question.

For training assessment questions, respondents provided confusing information. Only 44% of respondents indicated TF personnel served as evaluators or O/Cs for this event while 36% did not respond or indicated "not applicable" to this question. Also, 71% did not respond or responded "not applicable" when indicating whether evaluators provided valid and credible comments. However, 57% indicated feedback was focused on training objectives, meeting standards, and was linked to mission and mission essential tasks. In addition, 71% indicated lessons learned were identified and were helpful in sustaining and improving performance. Possibly, part of the confusion in this rated area arose from the fact that the TF personnel did self-evaluations of performance and provided their own evaluations to the TF Cdr at the AARs.

Lessons Learned and Implications for Future Training

This section presents training lessons learned and their implications for future Force XXI training. Lessons learned are based on observations, questionnaire information, and interview information from TF personnel. Implications are derived from (a) lessons learned, (b) information and ideas from TF personnel, and (c) information from sources such as briefing materials, ARI reports, Army periodicals, and Army publications.

Nine key categories of lessons learned were derived from observations of the AWE FD TF training and information collected from TF personnel. The ordering of these categories generally proceeds from the global to the specific. The lessons learned categories are: (a) training strategy, (b) training management, (c) training methods, (d) prerequisite skills and knowledge, (e) digital learning center, (f) simulation training, (g) training literature, (h) training assessment, and (i) training support. Each category contains lessons learned within the coverage of the general area. Additionally, each category presents implications associated with the lessons learned.

Training Strategy

Lessons Learned

The TF home-station training strategy was predicated on lessons learned from AWE Desert Hammer VI. That is, the overarching design was focused on training combat fundamentals to proficiency then training digital skills to proficiency then integrating the two to train digital warfighting skills. The planned strategy was to conduct a crawl-walk-run approach while using all simulation environments to achieve the "run" at the Live/Virtual experiment. Within the strategy was the intent to train Plt, Co, Bn staff, and TF to a conventional baseline proficiency. After training collectively to conventional proficiency, the strategy was to integrate the digital training and conduct a repetitive cycle of sustainment of conventional and digital training to maintain skill proficiency. Additionally, the various BOS elements were to be integrated while training to conventional and digital proficiency.

For conventional baseline train-up in "crawl" mode, the TF conducted conventional group and unit training by conducting Plt and Co lane training in the MWSTC (virtual simulation) and by conducting field exercises starting at the beginning of the year and continuing into the summer months. For staff training, the orders process was performed once per week to initially train then maintain proficiency. Additionally, command and staff training was conducted in collective exercises in constructive (i.e., Janus CPX) and virtual (i.e., TF SIMUTA exercises in MWSTC) environments. During the TF SIMUTA exercises, all TF BOS assets were incorporated into training as much as possible. At the conclusion of the TF SIMUTA exercises, the TF Cdr considered the TF at a "walk" level as a conventionally trained unit. After graduating the TF SIMUTA training, CSS slices were integrated into all unit training exercises (mainly at the Plt and Co level).

The TF started digital training efforts as early as the conventional training efforts started. The "crawl" phase with digital began in January with M1A2 NET training for B Co/Tm personnel. Individual IVIS training started in February on laptop PCs with tutorials (i.e., IVIS emulation and programmed text) or in motor pool classes on IVIS equipment. The TF personnel were given until 1 March to train individually on IVIS. Reportedly, a short certification test was conducted for individuals to examine their IVIS basic operation capability before proceeding beyond individual training. In mid-February, individual group-paced instruction was conducted on the B2C2. In early March, the TF DLC was implemented for continuation of individual, small group, and staff digital training. The DLC allowed the TF personnel to train on IVIS emulations on WSs that ran in stand-alone mode or as a local area network (LAN) for small group interactive digital training. Each Co and HQ had one day per week to conduct training in the DLC.

As the unit received digital equipment, it was incorporated into the DLC for staff and collective training. In April, a TF slice conducted digital collective training (i.e., VS1) in a virtual simulation environment (MWTB). The BOS integration occurred for FA, Engineers, CSS, and ADA elements. However, digital BOS integration only occurred with FA elements. The staff and TF elements conducted a COMMEX and TF slice FTX using the DLC as the TOC C2V and TF digital elements in the motor pool and local training area. Selected CSS elements were played digitally in the field. Also, the staff continued to conduct weekly orders process drills but with digital equipment. During the Janus CPX in late May, a constructive simulation command and staff exercise, some digital equipment, and an emulated IVIS (with advanced functions on a Janus terminal) were used to conduct TF operations in selected TF missions. Only the emulated IVIS was integrated fully into the exercise, restricting the use of other digital equipment for TF C2 and BOS integration. The TF was considered in the "walk" phase of digital training upon conducting their TF FTX in June in the local training area. During the exercise they used most of the TF C2 vehicles and the digital equipment for most BOS elements. The FA, Engineers, and CSS elements were integrated into the missions.

According to TF personnel, several BOS elements designated to receive B2C2s were given update training after arrival at the WKTA training area. An IVIS Improved Ground Station (IGS) with keyboard was provided to certain TF elements, i.e., S3 Air in the C2V TOC, Engineer in the C2V CTCP, and the B Co/Tm 1SG. (These soldiers had not had prior experience or training for working IVIS with a keyboard.) Prior to departure for WKTA, the CSS elements designated to use the MTS were given training but the S4, the CSS C2 element in the CTCP, was unable to attend. The S4 received informal training from a trained CSS soldier while traveling to the WKTA.

The TF generally followed their TF Cdr's training strategy. It was not possible for the TF to collectively train in conventional combat fundamentals prior to starting digital training. As the TF progressed into conventional collective training, they started their individual digital training. The TF reached their "walk" phase of training conventional skills at least two months before reaching their "walk" phase in training digital system integration into combat operations.

Generally, all TF elements and some BOS elements (i.e., Engineers and CSS) had the opportunity to achieve proficiency in conventional combat fundamentals all the way to the collective TF level. Problems with late arrival of digital equipment, lack of enough equipment (for CSS personnel), and turbulence in external BOS personnel (i.e., FA and ADA) prevented complete digital integration into most collective events prior to the Live-Virtual experiment. Engineers did not receive digital equipment until arriving at WKTA. A key deficiency existed for the TF in that

they had not been able to conduct training with all CA BOS elements conventionally and digitally while at home station.

The problem of assessing proficiency at different levels was a noticeable shortcoming. For conventional TF operations at different levels, the TF had standards from Army documentation. Assessment of digital proficiency at small group, unit, staff, and TF was problematic. At the individual level, the TF created standards to certify individuals in IVIS digital operations by March. No individual certification by the TF was done for other digital systems. One of the biggest concerns, according to the TF Cdr, was the lack of criteria for determining successful TF digital operations. Despite the lack of digital proficiency standards, the TF appeared to attain a sufficient level of digital proficiency for conducting missions in the Live-Virtual experiment.

Although the TF attempted to follow the hierarchical training strategy approach, their compressed time schedule forced them into starting digital training efforts prior to completing training of combat fundamentals. The hierarchical training strategy remains to be tested but the TF's success in conducting warfighting missions at the WKTA does provide support that even the modified training strategy may be successful.

In summary, the lessons learned for training strategy are that mastering combat fundamentals, followed by digital training and integration into warfighting operations, can be a sound approach. Generally, using a crawl-walk-run strategy with provisions for sustainment training in individual, unit, and staff conventional and digital operations is also a good approach to use. However, weaknesses exist in assessing when different TF echelons have reached levels of proficiency, especially in regard to digital operations. Additionally, complete BOS integration at the Bn level becomes especially troublesome when attempting to integrate BOS elements through digital operations and when the digital equipment for complete integration is not available.

Implications

The basic training strategy derived from lessons learned in Desert Hammer VI can be extended. Figure 11 illustrates a conceptual refinement of the pyramid structure previously depicted in Figure 3. The same approach of training basic combat fundamentals should proceed for individuals through upper echelons of the unit. Individual to unit training should use a combination of simulations to attain basic combat fundamental proficiency while using conventional equipment or simulated equipment. Building on a firm base in combat fundamentals, the unit should start digital training and integrate digital system operations into its combat operations. Again, the unit should receive NET (or some operator training) on digital equipment and continue individual to unit level training using a variety of simulation environments to achieve increasing levels of

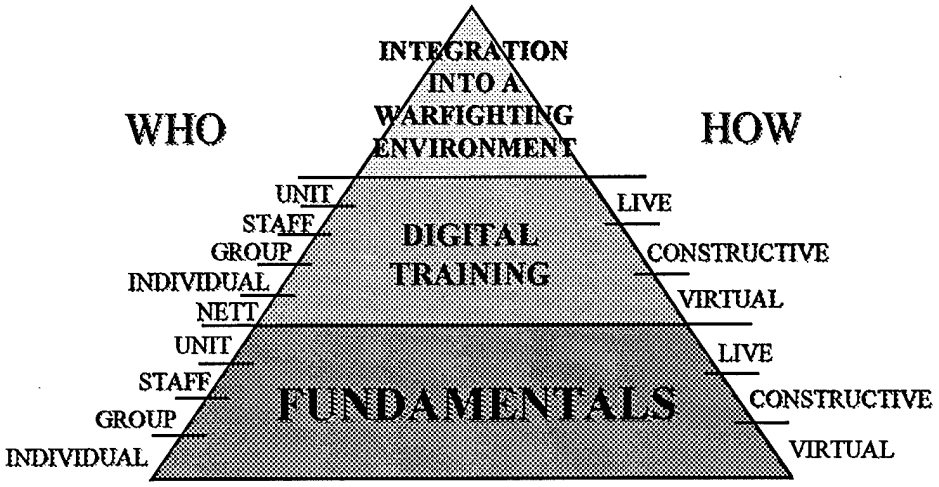

Figure 11. Conceptual refinement of a training hierarchy strategy to achieve digital warfighting capability.

proficiency. Sustainment training should be ongoing throughout the process to maintain perishable digital skills. Once the unit has successfully integrated digital system operations with combat operations, the digitally-equipped unit should be ready to proceed into a warfighting environment.

To accomplish the task of digital integration, a structured training program should be emplaced to support individual through unit level training. Additionally, the program should contain criteria for proficiency (gates) for clear progression of training. Figure 12 illustrates a conceptual program architecture for the training of individuals, small groups, and teams.

The Bn staff serves as a good example to illustrate the program. As observed in the AWE FD TF, personnel arrive with various levels of staff experience. In fact some had no prior formal staff training (i.e., the S1 and S4), some had staff experience with some formal training from the Armor Officers Advanced Course (AOAC) (i.e., S3 Air and S2), while others had much more experience (i.e., Bn Cdr). According to the upper left-hand box in Figure 12, individual staff position training could be accomplished through computer-based instruction (CBI). With CBI, each individual staff member could be tested to assure competency. Upon successful completion of individual training, staff members would pass to the next level (in the lower left ellipse) of combined command and staff training. Two-member or three-member teams could train together in structured, progressive exercises in a computer simulation. As an example, the staff could train together as a C2V TOC staff. The eventual goal would be to train the full staff as a team proficient in individual and staff skills. The training program could be progressively structured, much like a Unit Conduct of Fire

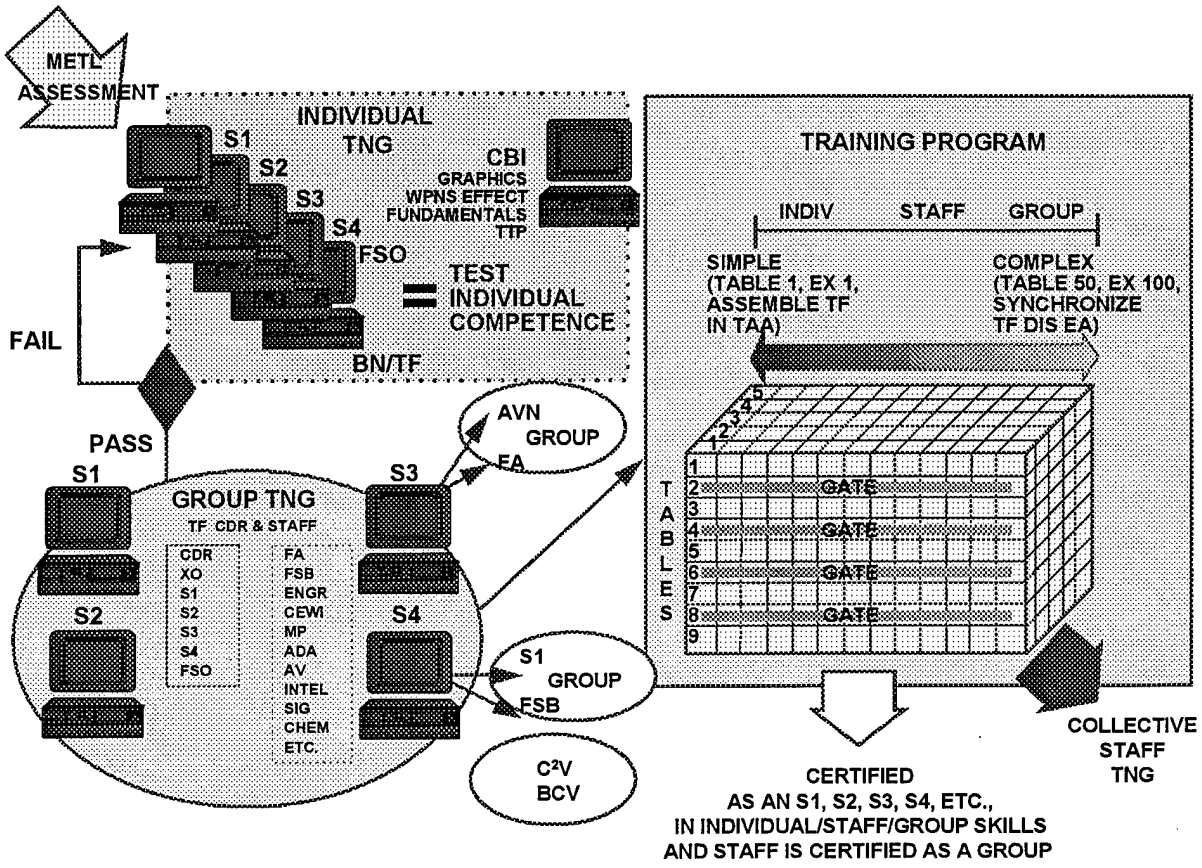

Figure 12. Structured individual/team/staff training program.

Trainer (UCOFT) training matrix. The program might contain various exercises ranging from individual to team and simple to complex within each level (i.e., individual, staff, and TF team) with proficiency gates having to be completed before progressing to the next level of difficulty. However, as with UCOFT training, the staff may be proficient enough to progress to collective training before completing the matrix.

The TF commander and staff would enter a collective training environment where they could be integrated into more complex training in virtual, constructive, and live simulation (Figure 13). Again, these simulation environments would have their own training matrix of simple to complex exercises and contain tables with gates to lead the staff through increasingly complex exercises. Moving between the different simulation training programs could be contingent on mastering previous levels or blocks in prior simulation training programs. For example, since live simulation exercises are usually more expensive, participating in live simulation may be contingent on demonstrating a certain level of proficiency in constructive and virtual simulation training programs. As a specific example, the

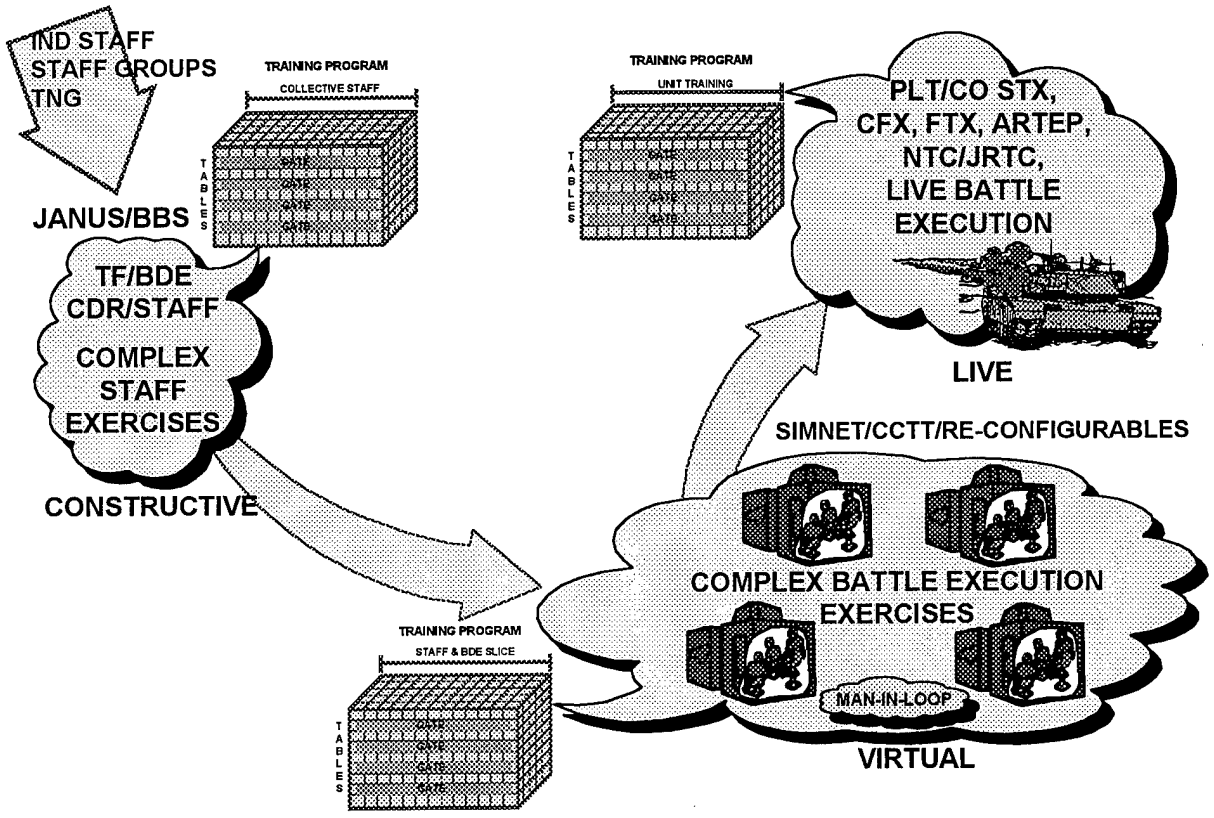

Figure 13. Structured training program for collective staff/unit training.

AWE FD TF did not conduct a full TF FTX in the field until the TF had performed virtual and constructive collective training in conventional and digital environments.

Currently, training research is ongoing to develop training program technology to support this type of training strategy. One training technology successfully applied in AWE FD was the SIMUTA-based materials and exercises. These exercises were used in the MWSTC and Janus facility for conventional collective maneuver and command and staff training, respectively (Turecek, et al., 1995).

One current ARI-sponsored training technology program is the Innovative Tools and Techniques for Brigade and Below Staff Training (ITTBBST) research program (BDM Federal Inc., 1995). One part of the program is slated to develop a Battle Staff Training System (BSTS) which uses paper-based and multimedia CBI methods for training individual staff members on skills required in various staff functions. Another innovative technology in the program is the Cdr/Staff Trainer (C/ST) which uses six linked

UNIX-based WS to train battalion staff to process battlefield information and create mission relevant message traffic. The C/ST could be used for both conventionally-equipped and digitally-equipped forces.

Another ARI-managed training innovation for training small groups in conventional operations is the Combined-arms Operations at Brigade Level, Realistically Achieved through Simulation (COBRAS) (Human Resources Research Organization, 1994). A set of staff training vignettes is undergoing development and will be used to train staff officers working as two-, three-, or four-member teams to plan, prepare, and execute missions in virtual and constructive simulation environments. All these innovative methodologies provide for training the different BOS elements separately at first, then together as teams. This innovative approach could be integrated into the suggested training strategy.

Training Management

Lessons Learned

One of the lessons learned from AWE Desert Hammer VI was that digital systems create new tasks, modify some conventional tasks, and may not affect other conventional tasks (Kollhoff, 1995). Although the same digital C2 systems were used, the AWE FD TF did not train with any recognized digital task documentation for guiding task-based training. Although tactics and techniques were available in the form of STs and conventional Army Training and Evaluation Program (ARTEP) MTPs, no digital task lists were available. Rather, as digital equipment was received, its operation and functions were incorporated into unit operations and TACSOP then iteratively trained and refined throughout home-station training. Only one instance of a task-based development effort occurred. This occurred when MBBL personnel identified specific Bn and Co/Tm tasks and sub-tasks that would be implemented (e.g., as Alpha and Beta cases) according to the use (or non-use) of specific digital equipment during the VS1 experiment. Unfortunately, no training was developed or executed for these modified tasks prior to conducting VS1.

According to FM 25-101, Battle Focused Training (U.S. Department of the Army, 1990a), Cdrs develop their unit's Mission Essential Task List (METL) according to wartime plans and external directives. When no MTPs exist, Cdrs should use applicable primary source materials (i.e., MTPs) or other source materials, i.e., TACSOPs, technical manuals, TO&E, etc. Interviews with key TF personnel indicated that there were no notional mission statements or digital METL at Bde or Bn level and there were no other materials than the STs available for developing or refining a TF digital METL. Since there was no supporting TO&E METL, the TF developed their own conventional METL (by June) and subsequently developed a notional digital METL

based on digital operations at that time. The TF had little, if any, opportunity to apply a planned task-based approach for training individual through collective digital operations in home-station training.

One technology that may have been helpful to the Bn for developing their METL, if introduced much earlier, was the Standard Army Training System-Training Exercise Development System (SATS-TREDS) technology. The SATS-TREDS system and Janus SW for WS use was provided to the unit as part of the STRICOM training and experimentation. The SATS-TREDS system had the armor-related conventional tasks and MTPs with training and evaluation outlines (T&EOs) in a database. The system also contained other functions enabling the user to create model task-based training opportunities, i.e., task-based Co-level training exercise with Janus. The system was given to them in mid-May which was very late in the training cycle to have been much use for home-station training. The laptop PC with the SATS-TREDS system represented an automation technology tool that could have been useful for planning and assessing task-based training, albeit if only for a conventionally equipped unit. This tool may have proved useful for rapid development of a training program and exercises and could have served as a method for identifying tasks impacted by digital operations.

The lesson learned is that units need to use task-based training management to effectively train, whether conventionally or digitally-equipped. The prescriptive process described in FM 25-101, Battle Focused Training (U.S. Department of the Army, 1990a) is a legitimate approach to planning, executing, and assessing training. Units need access to adequate mission statements and METL documentation for developing battle-focused training and warfighting skills. With the advent of digital equipment, units cannot rely exclusively on documents (i.e., MTPs) developed for conventional TO&E units. Given the lack of digital SMEs in the force, Cdrs and unit personnel will likely have to develop their own source information for the near future. Using the notional digital METL developed by TF 2-33 AR may be a good starting point for future Force XXI task-based management efforts. An automated method like the SATS-TREDS SW may be useful to assist the Cdr and his staff in this process.

Implications

As before, the need still exists to identify new tasks, tasks in need of modification, and tasks not affected by the introduction of digital equipment into the force. The battle-focused training management process will suffer unless efforts to conduct functional task analysis are incorporated into digitized force development efforts. Efforts at developing task-based training strategies and programs may fail without fundamental front-end analysis of how digital systems affect tasks. Analysis efforts should also examine how digital systems affect information flow between unit elements and external unit

elements. Additionally, efforts should show how associated information processing affects individual through collective tasks.

One possible implication is that TRADOC proponent schools may need to become involved in the digital task analysis process. TRADOC schools are staffed with training developers who perform task analysis in accordance with TRADOC regulations and guidance. According to TRADOC Pamphlet 351-13, Systems Approach to Training -Analysis (U.S. Department of the Army, 1990b), a team led by training developers is the approach to use for proper mission and subsequent task analysis. A couple of cues to signal the conduct of mission and task analysis is when there are "Significant changes in the operational concept and employment doctrine of a unit" and when there are "Substantial changes in the mission or capabilities of an existing unit" (p. 4). TRADOC pamphlets 525-5 (U.S. Department of the Army, 1994b) and 525-69 (U.S. Department of the Army, 1995g) establish the doctrinal Force XXI and information operations for the force. Digital equipment clearly gives units substantial capabilities. Thus, a clear need exists for involving TRADOC training developers in the task analysis process. School training developers should be brought into the AWE process at the front end to assist the task identification and analysis and subsequent training. Consequently, TF 2-33 AR's notional digital METL may prove to be a valuable resource starting digital task analysis efforts.

An implication for future training planning and management stems from the SATS-TREDS experiment the unit underwent. The SATS-TREDS prototype was a capability the unit never had the opportunity to truly utilize to assist them in training management. Future force Cdrs may be able to avail themselves of similar automated tools that assist the battle focused training process. Under the Joint Venture Campaign umbrella is the Warfighter XXI (WF XXI) Campaign Plan which focuses on unit training and automates the CA training strategy (CATS) (Marlin, 1995). An information architecture concept known as the Army Training Information Management Program (ATIMP) serves to orchestrate technologies and methods to accomplish WF XXI. The ATIMP includes several technologies and tools to assist the training management process.

One of the ATIMP training technologies is the Standard Army Training System (SATS), an automated computer-based SW training management tool that: (a) implements the battle focused training approach, (b) provides prescriptive and descriptive CA training guidance, and (c) provides the capability to capture training resource usage and costs for budgeting, managing, and programming unit resources (U.S. Department of the Army, 1995c).

The SATS will assist future Cdrs and their training staff as they: (a) develop and refine unit METL and training priorities, (b) implement higher headquarter training guidance, (c) assess and report the unit's resource usage and training status, (d)

develop an optimal training plan, (e) produce unit training calendars and other training support documents, (f) integrate doctrinal and proponent guidance into training plans, (g) identify and schedule training resources (i.e., training aids, devices, simulators, and simulations (TADSS), ranges, etc.), (h) evaluate training executed, and (i) provide for rapid adjustment to training plans based on unforeseen requirements or lost resources.

Training Methods

Lessons Learned

During home-station training, AWE FD TF personnel were exposed to a variety of training methods and technologies. Primarily, these methods and technologies were used during the initial individual operator training and small group training phases.

Tutorials were well received as indicated by soldier responses in questionnaires and interviews. There were different methods and technologies for the tutorials used. For initial operator training on a digital system, leaders indicated the IVIS emulation tutorial worked well to get the TF personnel familiar with IVIS operations. The IVIS emulation was portable SW able to be used on laptop PCs as well as powerful WS. There were problems reported in using the emulation SW. First, the SW was distributed without any introductory training or explanation. The IVIS SW version 1.9 was different than the actual IVIS version (i.e., version 2.3.2) which reportedly created some confusion for soldiers when they used the actual IVIS. Additionally, there were no instruction manuals describing how the system could be started, used, or fixed. There were problems reported with the system crashing during operations on laptop computers. Additionally, there was not any on-line help or diagnostics to assist the user. Despite the problems, leaders thought the emulation SW was a good initial starting point for system familiarization.

Another method of training with the IVIS tutorials was to use the programmed text lessons for training the functional aspects of IVIS, i.e., the IVIS routing matrix. However, programmed text without the use of SW was not well received according to ratings provided by leaders who used the system for training. Programmed text by itself was not considered a viable learning option compared to actual equipment. When programmed text was used in conjunction with the computer-based emulation, the leaders indicated they learned more than using actual equipment. Some problems were noted with mismatches between the programmed text and the emulation SW. Additionally, there were indications that there was a lack of feedback associated with this particular combination.

The IVIS-ICAT courseware used on the WS in the DLC was the most popular method for tutorials. This was not unexpected given its structured approach to providing sequenced and progressively advanced lessons for training IVIS operations. It also was based on intelligent tutoring theory and was more representative of individual interactive computer-based instruction. Additionally, it had a networking feature that was used in small group instruction which allowed it to be used for vertical and horizontal slice training. Noted deficiencies were the (a) outdated IVIS version compared to the real equipment, (b) lack of student record keeping functions, and (c) lack of capability to allow faster progression for more computer literate individuals.

Besides tutorials there was group-paced classroom instruction for the B2C2 operator training. Although leaders perceived this training as adequate, they indicated that the pace of training was too fast and that the time was not used efficiently. Leaders reported that there were too few systems for personnel to use and not enough assistant instructors present to assist the training.

In sum, the self-paced tutorial methods appeared to be preferable to using the group-paced method for initial operator instruction on digital systems. One key point is that everyone wanted hands-on training which they were able to do with tutorials. Another key point is tutorials allowed individuals to progress at their own pace. Group-paced training had its advantages in that on-site questions could be asked and answered by an expert on the system. Also, group-pacing provided motivation for individuals to participate and keep up with the trainer.

In summary, several lessons were learned about the use of self-paced tutorials for initial training and sustainment. Tutorials need to be explained as to where they fit in training and how they operate. A manual of instructions to go with their use should be provided. Tutorial SW should closely emulate the functions of the actual system to prevent negative training and proactive interference when users operate the actual systems. Tutorials should have on-line help and feedback to assist the learning process. Student progress and record-keeping functions should be included for trainees and unit trainers to monitor usage and progress. Lessons should be sequenced and progressive in difficulty. The tutorial SW should be interactive courseware. Tutorial courseware should be able to adapt to different levels of individual expertise. Student diagnostics and remediation also need to be included in the courseware.

With regard to group-paced instruction, enough equipment must be provided for everyone to actively participate in the training. Enough instructors should be present to provide timely assistance to students and for solving encountered problems. The group-pace needs to be monitored frequently so slower paced individuals do not fall behind, but also so faster paced

individuals do not get bored. When training equipment procedure tasks, lessons and PEs should be taught in a progressive sequenced. Lessons should build on previous lessons and be structured according to increasing levels of task difficulty.

Implications

The TF leadership preferred tutorial methods as a way to provide initial individual training for digital systems. The TF Cdr thought they were good to the point where individuals start to plateau on the learning curve, then new challenges are needed. Unfortunately, there were no established proficiency level criteria to indicate when soldiers had reached the plateau point. Future tutorials need to include proficiency gates with record keeping functions to monitor skill progression. The NASA IVIS-ICAT courseware is based on interactive artificially intelligent architecture (Way, 1993) to maximize human learning. Tutorial courseware based on these types of models should be considered as the preferred method for tutorial instruction for initial training of digital systems. Possibly other types of initial training might benefit from tutorials. For example, tutorials might be effective in teaching the digital network connections for the force.

An implication for tutorial SW is that it could be fielded with new digital systems as useful emulators of those systems. If PC emulations of the digital equipment can be realistically modelled with enough fidelity to match the actual equipment, these emulations could prove to be a valuable tool for training the force. Further, SW emulations should be fielded with the equipment and updated when equipment updates occur. Tutorial SW also should include a networking feature to allow the students to start working as small teams to practice interactive operations with others. This bridge to small team efforts could serve to mitigate the plateau effect individuals reach when finishing the individual lessons. Structured training PEs should be developed to assist individual and initial small team training efforts. Supplemental training materials for trainers should be provided to aid the instructional process. A key implication is the tutorials will only be used to the extent a unit chain of command supports their use. Tutorials must be incorporated as an integral part of the unit training strategy and receive command emphasis to be a useful tool in training the force.

Prerequisite Skills and Knowledge

Lessons Learned

Most of the personnel surveyed thought that there were no special skills required for soldiers to operate and use digital equipment. However, they did think that having basic computer literacy skills was helpful. Our observations were that soldiers with previous computer experience were initially used in training support and for computer operations at the HQ. However, soldiers

without previous computer experience rapidly acquired high levels of proficiency in operating the digital equipment just through sheer repetition. Notably, their attitude, motivation, and willingness to learn were the most outstanding attributes in acquiring digital proficiency.

The digital systems required varying levels of computer skills to operate. IVIS, in comparison to most digital C2 systems used, was relatively primitive, less functional, and had a very unfriendly soldier-machine interface (SMI). The ASAS was relatively sophisticated, had multiple functions, but had an easier SMI with some on-line assistance. The MTS SW was based on the Windows interface and was very user friendly for people with prior Windows experience. For example, the S4 acquired skill in its use within two hours of travel to WKTA which he attributed to his previous working knowledge of Windows. Additionally, system troubleshooting skills were recognized as a problem by support personnel, i.e., the CESO. Systems like the B2C2 had several problems that were SW related that could have been diagnosed by knowledgeable operators with proper reference materials. Part of the lack of skill stemmed from lack of knowledge of updated versions of SW. However, much of the problem resulted from a basic lack of familiarity with the digital system itself. Operators need a more in depth working knowledge of their systems to be able to diagnose and troubleshoot problems.

Most of the comments in interviews indicated that in the future, soldiers arriving in the unit might require special knowledge and skills that are currently not required. Some TF leaders thought soldiers might have to have special knowledge about specific digital systems before arrival. Additionally, they thought the level of skill and knowledge would be applicable to the level of rank and position they were to have at the unit. For example, a tank Cdr may not need much more than NET on IVIS and would need to understand the basic reporting system. However, a Co Cdr would have to have more understanding and skill in tasks such as creating overlays in order to fulfill his duties in a digitized TF.

One particular problem noted in our observations was the lack of digital architecture knowledge. Part of this was attributable to the early focus on IVIS as the centerpiece of C2 for the unit. Part was attributable to the gradual introduction of legacy systems into the unit over time. However, no one ever presented the overall planned digital C2 architecture for all the legacy systems to be used in AWE FD and how they would be networked. The MBBL had the wiring diagram and selected unit leaders participated in the decision but the information was never trained to our knowledge. In interviews about future unit requirements for information, some leaders indicated that personnel should have a clear picture of the overall TF digital architecture so they could "see" who they would interact with and what digital information system they would use for this communication.

Another observation was that three of the four primary C2 systems used keyboards for input. Some IVIS systems in key C2 vehicles later received keyboards as a HW update). Many soldiers had no basic keyboarding skills when starting and many developed "two finger" typing approaches to touch typing. One officer, who worked in the C2V TOC on the B2C2, remarked in a subsequent interview that he was "never so glad that he had taken a touch typing course in junior high school." The TF personnel often sent digital messages as blocks of free text rather than using pre-formatted reports. Because of the lack of touch typing capability, digital system operators had to take their eyes off displays to type information. Not only did efficiency suffer but the potential to lose situational awareness increased.

It appears that the future force will also need to possess digital information management skills. Many TF leaders recognized this as a major shortcoming in training. Most of their ability to manage information came through sheer immersion in team and collective training events under stressful conditions. Several felt immersion in a stressful digital message environment was the key to learning to handle and filter battlefield information. One example used was that the S4 never got to play digitally during home-station training under any real information management workload. While at WKTA, it was related that he was overwhelmed when the TF started conducting offensive operations because he went from handling one or two digital nodes to 13 nodes on the network. TF leaders also recognized a need for training information handling strategies.

In sum, no special skills were identified as requirements for soldiers to operate digital equipment. However, several lessons learned were identified concerning desired prerequisite skills and knowledge for soldiers reporting to a digitized force environment. These identified skills and knowledge included: (a) basic computer literacy such as computer nomenclature and computer component knowledge, (b) understanding the overall digital architecture and connections, (c) specific digital system knowledge to enable operators to efficiently operate the system and diagnose and fix common system problems, (d) basic keyboarding skill for systems requiring keyboard input, and (e) information management training with specific emphasis on management strategies and immersion training for handling increased workload. Factors influencing the level of skills and knowledge required included (a) the entry level position of the soldier in the digitized unit, (b) the level of specific digital system sophistication, and (c) the SMI interface.

Implications

Many of the leaders in the TF recognized that most soldiers entering today's Army are more computer literate than themselves. Tomorrow's soldiers, enlisted and commissioned officers, probably will have had computer experience prior to joining the Army. Currently, Army training in basic computer skills may not be a

specific course requirement until an enlisted soldier enters the first leadership course.

For institutional training, the TF Cdr recommended that the Basic Non-Commissioned Officers Course (BNCOC) and Advanced Non-Commissioned Officers Course (ANCOC) should include a basic understanding of digital systems and capabilities, and how they will use them as part of their MOS, rank, and duty position. He also indicated the same lessons should be incorporated into the Officer's Advanced Course (OAC), Officer's Basic Course (OBC) and Command and General Staff College (CGSC). Some officers indicated that there should be a digital component in a course like the Tank Cdr's Certification Course (TC3) for soldiers designated to report to future digital units.

With regard to unit training, it was recommended all soldiers receive NET training on digital equipment when a unit receives the equipment. One low cost technology that may help the soldiers become more proficient in keyboarding skills would be to supply commercial off-the-shelf SW for tutoring, drilling, and practicing touch typing. The SW could be loaded on laptop computers, DLC computers, or even unit HQ computers for opportunity training. Standards for words per minute could be adopted for different systems or unit needs. Since most of these systems keep automated scoring, proficiency levels could be easily obtained for individual soldiers to monitor initial progress and sustainment in keyboarding skills.

For information management training, linked WSs could be used to conduct an information management exercise (IMEX). Research has been sponsored by ARI for developing an IMEX system to train small unit leaders to manage incoming information effectively and efficiently (Winsch, Atwood, Sawyer, Quinkert, Heiden, Smith, and Schwartz, 1994). The system was designed to systematically increase information load over a sequence of training vignettes for progressively increasing training difficulty. The system was also designed to provide performance feedback to soldiers in an AAR structure with a training coordinator facilitating group discussion and exchange. This technology could be used to train students in leadership courses at the institution or be used in a unit's DLC.

Another implication for future force training is the need for digital systems to have intuitive SMI interfaces like a Windows environment. Less operator training may be needed if the digital system SMI possessed functional displays similar to popular commercial off-the-shelf SW. An example of initial training efficiency was the S4's experience with the MTS Windows-based interface. This example illustrates the positive transfer that one program with a similar interface can have if using an application program containing a similar interface. The use of a common interface might also have beneficial effects on retention and subsequent sustainment training. The S3 Air indicated that the IVIS menu structure was hard to remember without frequent

sustainment training. One advantage of a Windows-based operating system is that generally menu structures are located in similar locations regardless of applications. The potential to reduce initial training and sustainment training requirements cannot be ignored.

A final implication is that the overall digital network structure is a fundamental knowledge that should be trained. If using digital systems that have to interact within and across BOS structures, a simple color coded job aid could be developed to help soldiers remember connections and radio nets. The IVIS job aid handed out in the digital TTP class was an example of an attempt to provide such an aid. Diagrammed job aid "cheat sheets" were observed being used by digital system operators during home-station training, and were reportedly used in collective home-station training and during the Live-Virtual experiment in WKTA.

Digital Learning Center

Lessons Learned

The DLC was viewed as a key component for the TF digital training strategy. The TF Cdr noted the DLC gave the unit the capability to conduct individual, Plt, Co, and TF level digital training. He noted the DLC provided the capability to train vertical and horizontal slices within and across BOS. Also, he noted the DLC provided a sustainment capability for maintaining perishable digital skills through hands-on training. In fact, the Cdr stated digital skills were as perishable as NBC skills (J. E. Orr, personal communication, September 22, 1995).

The DLC was an extremely flexible environment to conduct a variety of training. Divided with a standard small classroom setting on one side, and the digital learning laboratory on the other side, the TF had the capability to conduct lecture and classes before proceeding to the hands-on portion of instruction. The learning laboratory was originally equipped with six Sun SPARC WS that could host PC-based and UNIX-based SW for different IVIS emulations. The WS were utilized to conduct individual to small team training. After VS1 the TF equipped the lab with the four primary C2 digital systems to serve as a base for conducting COMMEXs, limited CPXs, and TF slice FTXs. Additionally, the TF personnel built a wooden station that approximated the layout of the C2V. They also arranged the equipment according to the C2V layout. Eventually they draped the area to simulate the close proximity of the C2V shell to force the TOC participants to work in similar conditions they would have in the actual C2V. The actual equipment was linked with SINCGARS radios to communicate with other digitally equipped vehicles in motor pools and in the local training area. The lab served as a stationary CP for several of the exercises.

Key unit personnel such as the master gunner were tasked to be responsible for security and some of the initial training on IVIS. The TF maintained a schedule to allow each Co and HQ a day each week for conducting their training.

In summary, a DLC is a required environment to meet the training strategy for digital operations. A DLC should be equipped with powerful WS that can be linked to host digital equipment emulation SW, tutorials, and other SW for unit use, i.e., touch typing programs for sustaining keyboarding skills. Capabilities to incorporate real digital and radio equipment should be provided for a unit to use the center as a stationary TOC CP or other CPs. Layouts should be constructed and equipment arranged to resemble C2 vehicle layouts. Room and standard classroom furniture and equipment should be provided to conduct standard group and platform-based instruction.

Implications

Future Force XXI units need a unit DLC to host a variety of digital training operations and provide a digital sustainment capability. Several issues will need to be resolved for developing a standard DLC with equipment, personnel, and SOP for units to use.

A key issue to be considered is the use of WS versus actual equipment for training. The AWE FD TF preferred using the actual equipment in part because of the dismal performance they experienced when using simulators and emulators in VS1. Also, they used the actual equipment because (a) they did not have enough WSs, (b) WSs did not have the capability to interface with the SINCGARS at the DLC, and (c) they did not have the correct up-to-date emulation SW for the digital equipment. Future DLCs should be equipped with WSs with up-to-date emulation SW that has the capability to link with radios and function as the actual equipment. This capability would allow more flexibility to be added to the training capabilities of the DLC (as seen with real equipment) and would not tie up TO&E equipment that could be used in the field.

Another training capability the future DLC could use would be a Janus capability to train Co-level and higher Cdrs and staff. The AWE FD TF used a version of Janus they retained from the SATS-TREDS experiment. They reportedly continued to use the Janus simulation for some leader training and staff training. This constructive simulation training capability, hosted on WSs, could serve as a driver for conducting Co level and higher exercises on site with appropriate structured training. Additionally, it could serve as a driver for battle staff training or as a complement to the proposed BSTS and C/ST mentioned in the previous training strategy section.

Whatever training capabilities are eventually provided for the DLC, structured turn-key training packages (i.e., like

SIMUTA) need to be developed and provided. An observation was that the unit did not have the resources or the personnel to develop systematic training to support some of the individual and team training events that were conducted there. They also did not have the trained personnel to conduct and evaluate the training. Structured training packages would have to contain proficiency gates and would have to provide structured materials and a train the trainer (T2) package to assist trainers in conducting effective training.

Simulation Training

Lessons Learned

Simulation training for purposes of this section refers to the training conducted in virtual and constructive environments. There were notable successes and failures across simulation training events that were key to training effectiveness for those events.

Virtual and constructive simulation training can be significantly enhanced when using structured training. The SIMUTA-based approach provided the TF efficient and effective training according to TF leaders and our observations. The structured materials built around MTC and DIS mission scenarios with a cadre of trained EXFAC to provide coaching and feedback provided the TF with quick learning experiences. This approach enabled the unit to rapidly achieve a higher level of proficiency in combat fundamentals as a conventionally equipped force. Most surveyed leaders indicated they knew the training objectives and understood the AAR feedback as individuals and as a collective force. The systematic training and focus on specific functions and tasks enabled the TF personnel to rapidly build upon strengths and improve upon noted weaknesses with each iteration of a mission.

Including the CS, CSS, and several BOS elements as players when the TF maneuver elements went into the simulation greatly enhanced training. Even though the TF CS and CSS forces could not directly participate within the simulation, the simulation served to drive their participation. The CS and CSS elements had radio linkages to the CP on the outside of the MWSTC and had different stations set up for their "play" with the exercise. The use of many TF assets to serve in direct support and complimentary roles allowed these elements to interact and simultaneously perform functions in synchronization with the TF Cdrs and staff. Additionally, the Cdrs, staff, and maneuver elements had the chance to train other functions beyond the maneuver and C2 functions they were to perform in simulation.

Unfortunately, when the TF trained as digitally equipped units and staff in virtual and constructive simulation, training was not as effective for several reasons. The events in simulation for using a digitized force were not geared toward

training but for experimentation. They were considered training events because the unit was still developing its collective skills, running missions, and iteratively repeating missions. Observations and TF personnel interview information indicated that no orientation training was conducted to explain the differences between the simulation versus other simulations versus the real world. Nor were capabilities and limitations of the simulation and SAFOR discussed with players on a formal basis. Without orientation training, TF personnel had to discover the differences over time and adapt as they learned instead of having planned workarounds to support their effort.

The digital play was extremely constrained and limited in both the virtual and constructive simulation environments. The IVIS used in VS1 crashed many times because of a lack of memory. It also lacked POSNAV capability and far target designate capability which forced the TF to operate in a degraded mode. In contrast, the Janus enhanced terminal in Janus III had more capabilities (i.e., terrain analysis and LOS functions) than the actual IVIS. None of the other primary digital C2 systems could participate in the simulations.

Layouts of digital vehicles were constrained in both virtual and constructive simulation environments. For VS1 the TF Cdr's BCV did not resemble the actual Bradley BCV, which prevented the BCV staff from working in the environment they would use later on the actual platform. No vehicle layouts were used in Janus III. In fact, the TOC personnel were not aligned on their worktables in the same order as they would be in the actual C2V TOC.

The EXFAC's observation of TF players and their digital operations was extremely limited in both simulations, especially in VS1. The monitoring station was not adequately equipped to monitor more than one C2 vehicle. The EXFACs were not trained on the digital equipment, did not possess structured observation materials for digitally equipped forces, and were simultaneously serving as data collectors.

Unlike when playing as a conventionally equipped force in MWSTC, BOS integration and integration of CS and CSS elements was extremely limited for digital play in both simulations, i.e., VS1 and Janus III. Engineers, ADA, and CSS elements in particular did not have interactive digital capabilities. They had to use radio voice simulations or piggyback off of other digital assets in VS1. In Janus, the CSS elements did not have interactive digital capabilities and the CSS portion of the Janus simulation was not activated. Another problem that limited the CSS play in all simulations was the rapid curtailment of the exercises after the fight. Inclusion of consolidation and reorganization tasks would have allowed the CSS assets more opportunity to conduct their functions.

Although dedicated simulation training events and experimental simulation events are not directly comparable, some

general lessons learned about simulation training can be derived from all events. Orientation training on limitations, capabilities, and differences between simulations, simulators, and emulations is critical to effective and efficient training. Orientation training directly impacts subsequent mission performance. Using designed structured training enhances simulation training. Also, a trained cadre of O/Cs can greatly improve the learning curve of the unit with structured feedback and the use of appropriate doctrinally-based checklists. Tools for monitoring digital operations in simulations need to be provided to collect information for valuable feedback during AARs. Equipment emulations need to functionally resemble their real world counterparts as much as possible to prevent negative training or partial training. Fidelity of equipment layout and vehicle layout should be maintained to provide realistic training for personnel working in C2 vehicles. Including and integrating BOS, CS, and CSS elements with maneuver and C2 during training with simulations increases the amount of collective training a unit can accomplish around a simulation event. Additionally, conducting exercises that include all phases of the mission would allow more CSS opportunities to participate. Providing enough digital assets for all TF and attached elements to participate is a critical need for all simulation exercises - virtual, constructive, and live.

Implications

Given the success of structured training packages that were designed to work with conventionally equipped units and within the parameters of the simulations, similar structured training packages designed for digitally equipped forces would provide enhancement to their training programs. Currently, ARI is sponsoring research and development of structured training packages for digitally equipped units. The Simulation-based Multi-echelon Training Program for Armor Units - Digital (SIMUTA-D) is an effort to adapt the successful SIMUTA program for use with digitally equipped units. This program is slated to yield structured training packages based on MTC, DIS, and DATK missions conducted in SIMNET and Janus simulation environments.

Efforts are ongoing to expand the structured training program packages for conventionally equipped forces. In the future, the force will still need training geared to conventional equipment for those forces still using that equipment and for training combat fundamentals without digital equipment. Two ARI-sponsored research programs, COBRAS and COBRAS II, are currently being conducted to develop structured and integrated training packages for a mounted Bde-level target audience. The COBRAS II program also seeks to develop SIMUTA-based training packages for an expanded Bn-level target audience.

Another implication is the definite need to integrate BOS elements, CS, and CSS elements into digital operations in all three simulation environments. All digital assets need to be

integrated into individual through collective unit training. This will allow proper synchronization of all elements to enable a unit to achieve true integration of digital warfighting operations.

Several issues with research implications for future training were raised during the AWE FD home-station training and experiment efforts. One implication was the need to develop more tools to allow EXFAC and other evaluators to monitor what occurs during digital operations between all critical nodes of the TF. The capability to visually monitor only the TF Cdr's C2 vehicle message traffic extremely narrowed the scope of the EXFAC efforts for examining the digital process. An issue concerns the attempt to integrate actual digital equipment with the SIMNET environment. Digital systems were not completely integrated into the simulation architecture, i.e., VS1 and Janus III. The implication is that further investigation is needed to determine whether this is a viable option for future simulation training efforts, and if so, how such integration would be used in training programs. Another issue raised and explored was the idea of combining simulation environments to allow more BOS and CA resources to interact for more intense exercises or for larger exercises with fewer physical elements. The Live-Virtual connection at WKTA and Fort Knox was an example of merging two simulations together for more complete TF operations. An implication is that other simulation hybrids such as constructive-virtual could be beneficial for expanding the scope of BOS and CA integration into training exercises.

Training Literature

Lessons Learned

Training literature includes doctrinal and training literature generated by approving proponent organizations. The AWE FD TF had two major doctrinal products to use with digital operations for the TF. These two documents were the ST 71-1-1, Tactics and Techniques for the Digitized Company Team (U.S. Army Armor School, 1995b) and ST 71-2-2, Tactics and Techniques for the Digitized Battalion Task Force (U.S. Army Armor School, 1995c). Most of the TTPs contained in the document centered around IVIS digital operations. These TTPs did not detail how other digital systems were to interact. (The limited functionality of IVIS and the free text capabilities of the B2C2 led to the TF using the B2C2 as a defacto digital system for TF C2 during later collective training events.) The STs did not address the B2C2 C2 operations in detail like the IVIS. Additionally, the EXFAC used the STs as the source to evaluate and assess TF actions during mission executions.

The TF leaders expressed their concerns over the lack of traditional task-based digital training literature, i.e., ARTEP MTPs which are used extensively for unit collective training programs. Additionally, it was noted there was no training

materials for individuals, crews, and Plts. The lack of task-based training literature which contain the tasks, conditions, and standards for developing and conducting performance oriented training, left the unit on its own to develop digital training.

The absence of digital proficiency standards was a problem noted by the TF Cdr. During an interview he remarked that he often wondered what the criteria was that determined success for TF digital operations. According to FM 25-101, Battle Focused Training (U.S. Department of the Army, 1990a), leaders use published materials such as ARTEP MTPs, soldiers manuals, FMs, and TMs to prepare for training and to prepare the training and evaluation outlines (T&EOs) for assessment. No materials other than the STs were available for the unit to use. Unfortunately, the STs had not been verified and did not necessarily contain the needed information (i.e., standards) to assist preparation of performance oriented training. The unit had to rely on materials that had been developed for conventionally equipped units to conduct training preparation.

In sum, the unit had access to doctrinal references but no training reference materials specifically geared toward aiding digital performance oriented training. It was unknown if other proponents have developed training documentation for digital performance training. In addition to ARTEP MTPs, leaders identified two other products as being useful for digitally equipped Force XXI organizations: (a) a generic digital tactical SOP and (b) TTP books for Plt digital operations, especially specialty Plt operations.

Implications

As noted in the training management section, proponent training developers need to be involved in the Force XXI process to develop tasks and associated training materials. Although doctrinal TTP materials are under revision for both STs, and ARI-sponsored contract work is ongoing for developing structured training programs for digital collective training, the proponent schools need to develop the approved training materials and guidance. The training burden on Force XXI units should not continue to grow but should be lessened by appropriate training support.

Training Assessment

Lessons Learned

The TF performed their own internal training assessment for their training activities, especially for digital operations. Externally controlled activities such as the Janus CPX, SIMUTA-based training in the MWSTC, VS1, and Janus III was performed by a cadre of trained EXFAC. Training feedback for individual operator training for IVIS NET and classes was limited to demonstrating performance of some IVIS operation tasks. Other

operator training with digital equipment in the DLC did not contain specific feedback for correcting and improving performance. Most individual and small group training was iterative training with repetition to learn from individual mistakes, i.e., trial and error learning.

The TF did not have external sources at higher echelons to assist in evaluating Co and higher echelon level performance during FTXs. This did not appear to be a hindrance to the AAR process. They did establish their own observer team for their TF slice and full-up FTX. They conducted their own reviews during AARs with command presence for asking directed questions. This process appeared to work well given they were the only ones with digital operation experience.

For home-station externally controlled activities, the EXFAC used SIMUTA-based materials and checklists for evaluating the TF as they conducted the SIMUTA missions. According to leader comments, feedback was well received and greatly helped the TF improve its performance. When it came to events in which the TF used digital equipment, comments were less complimentary. This is not to say the EXFAC help was not beneficial. Several areas for improvement in synchronization and integration efforts in planning and preparation were greatly affected by their feedback. But for specific help on utilizing the digital equipment to its full capabilities, the TF sought to rely on their internal judgement. Part of the reason was that the TF was in the process of developing new TTPs that were not necessarily in accordance with the ST manuals the EXFAC were using for a standard. Additionally, the EXFAC did not receive training on the digital equipment and did not know the digital system capabilities and limitations (especially for the simulation environment). Also, the EXFAC, as a group, did not have previous experience with digital operations. As mentioned before, the EXFAC did not have some of the tools needed to completely monitor TF operations with digital equipment. The TF tended to rely more on internal feedback when it came to using digital equipment.

In sum, training assessment for digital operations training was not to usual Army standards. The SIMUTA-based training assessment by EXFAC for conventional equipment operations was extremely helpful to the TF in developing their proficiency in normal doctrine and TF operations. The EXFAC assessment helped in synchronization and integration problems the TF was having when using digital equipment. However, when it came to digital operations, the TF personnel knew the limitations and capabilities of the equipment better than the EXFAC. Additionally, the TTPs were undergoing change. This process did not allow for a complete comparison of performance to standards since established standards for digital operations did not exist.

Implications

The future training assessment will be problematic until (a) legacy equipment is replaced with some standard digital equipment system(s), (b) doctrine is verified, and (c) training tasks and materials are available for building tasks, conditions, and standards for evaluating digital warfighting performance. Additionally, for the near to mid-term, there will not be many digital SMEs at higher echelon levels (or any levels) to conduct TF and higher echelon-level feedback. Digital SMEs with experience in operations have not been stabilized to form a cadre of O/Cs.

It has already been stated that the training developers must become involved in developing digital materials to support training. The same is true for training assessment. Task lists, conditions, and standards serve as the base for developing T&EOs and other evaluation instruments. The SIMUTA-based training packages, and trained EXFAC using evaluation materials from those packages, proved to be successful for assessment of TF conventional operations. Possibly, using a SIMUTA-based approach to develop a complete structured training and assessment package is one way to provide better assessment opportunities in future force training. Packages would also have to have T2 materials and training for O/Cs at units. Step-by-step instructions for developing SIMUTA-based training, including O/C training, is available in a current ARI product (Campbell, Campbell, Sanders, Flynn, and Myers, 1995). It may be possible that the structured training packages with T2 programs could assist near term efforts for training and training assessment. Possibly, Bns could train to serve as O/Cs for other Bns within the Bde, or a trained Bde cadre could evaluate all Bns.

Training Support

Lessons Learned

One of the biggest obstacles the TF faced was in securing the timely delivery of enough digital equipment to train the TF personnel. The TF Cdr indicated his unit could have been better trained if enough of the right digital equipment had been present in March to begin digital operation training. The TF only had four B2C2s for most of their home-station training. Some digital equipment (i.e., MTS) did not arrive until the week before departing to WKTA. Actual C2 vehicles did not arrive until the TF had completed some digital TF training exercises. The TF Cdr did not have the opportunity to train on his BCV until arriving in WKTA. The IVIS IGS with keyboards were added to some C2 vehicles, i.e., C2V and CTCP.

The SW versions for the primary digital equipment (i.e., B2C2 and IVIS) was updated several times and often was not in synchronization with training emulations. The B2C2 SW was updated at least twice after initial operator training, going

from version 3.4 to 3.6. The IVIS version 1.9 was the latest version available on the DLC WSs while the actual IVIS systems used version 2.3.2. Later, IVIS SW version 2.4 was available for some selected IVIS systems at WKTA.

Another problem was the lack of appropriate terrain databases for most of the home-station training. Most of the training was done locally with NTC databases on the electronic maps. Near the end of home-station training the TF received electronic versions of WKTA maps but no electronic versions of local training area maps.

Integration of BOS and CA into TF training efforts was limited due to personnel and equipment problems. The TF lost its primary FSO during train-up and ended up using Fort Sill personnel during the Live-Virtual experiment. Luckily, the TF had superb artillery school support with an officer and an NCO on site for most of the home-station training. The NCO participated in many of the TF training exercises and served on the Cdr's BCV in WKTA. The TF Cdr stated that the ADA PL was available only for two training events during home-station training. Many of the BOS elements could not be integrated digitally in many of the home-station training events.

Another personnel problem observed was that the TF had only one CESO for supervising and fixing electronic and computer problems. The CESO remarked that many problems between the digital equipment and electronic interface were SW disconnects. He stated he had not had SW training. Additionally, the CESO eventually had to craft the log-on cheat sheets when the SW updates arrived in WKTA and assist the training of the SW updates.

It was noted the TF had no central digital training officer. Originally, the Bn master gunner was tasked to oversee the DLC and IVIS training efforts. The Bn XO was originally assigned overwatch of B2C2 digital equipment. As NCOs, specialists, and officers became more familiar with digital systems, certain users would be designated as the TF specialist on the particular equipment operation. The S3 Air became the most proficient on IVIS and served as the reference source for IVIS functional operations.

Training support lessons learned from AWE FD may not be entirely applicable at higher echelon TO&E units where all BOS elements are available under their umbrella organizations. However, equipment, SW, and personnel lessons learned do pertain. Any future force needs to have its digital equipment in place for necessary individual through collective training. Digital platform layouts could be emulated in DLCs and simulation environments to replicate the field conditions until the actual platforms arrive. If not enough digital equipment is available, BOS elements should be scheduled to work vertically within BOS to develop their own SOPs and TTPs then work in horizontal slices to

integrate their working knowledge with the unit. Contractor personnel should be available for training the equipment and SW and be responsible for conducting update training when equipment and SW change. There needs to be additional CSS personnel added to support automation training, troubleshooting, and networking problems. Possible prescribed load list (PLL) changes have to occur to support operator troubleshooting and repair of digitally equipped systems.

Implications

Implications are straightforward from lessons learned about the resource constraints encountered by the AWE FD TF. Digital equipment must be available in sufficient quantities to support any type of collective training efforts, even if slices are involved. One problem is for supporting BOS elements like intelligence where only a few items of sophisticated equipment (i.e., ASAS) are available and information is drawn from many echelons higher. Efforts to coordinate the quantity needed for higher echelon units may need to be made much earlier than usual because of the limited number available at Bde and below units. Additionally, high-end WSs capable of hosting and emulating many types of SW need to be acquired to support the DLC concept. More sophisticated laptop computers may need to be acquired to allow soldiers to pursue their individual training if tutorials are used.

The TO&E personnel structure may need to be changed with the addition of more support at lower echelon levels. It is possible that an automation officer and support personnel will need to be established as part of the personnel structure in Bn-sized digital units. For example, an automation officer from Functional Area 53, a Warrant Officer from the 74B area, and a PSG with MOS 31 designation might be useful additional personnel. An S3 Air with Functional Area 53 as his secondary could support the DLC concept and develop in-house training on digital and automated systems plus digital warfighting training. Additionally, this officer with support personnel could serve in tandem with the CESO to maintain smooth operations of digital equipment. The CESO with support staff could support the HW whereas the automation officer with staff could support the SW.

Supply problems in PLL may be a problem unless line items are loaded to the list for digital support. The TF Cdr related that the hard drive on his B2C2 went down and the only replacement was located in the rear with field trains. It may be that future forces will have to carry some digital components on board for immediate operator fixes.

Summary

As future Force XXI AWEs and BLWEs are planned, training issues must be included in the Battle Lab Experimentation Plans (BLEPs) to focus on past lessons learned and evaluate

implications of those lessons for future training. The proponent schools as well as other members of the training community need to (a) become involved with the AWE process to assist in preparation of Force XXI documentation, (b) support training efforts for participating units in AWEs and BLWEs, and (c) become participants in charting their own role in the training process for Force XXI.

Of all the important lessons learned from this AWE FD (see Table 2), the single most important lesson learned is that the Army must continue to build on previous lessons learned. The Army should not repeat the same mistakes or rediscover what has already been done several times before. Although the training was built on the previous training lessons learned from AWE Desert Hammer VI, there was repetition of some of the deficiencies and problems encountered in the last experiment. For example, the TF did build a successful strategy based on recommended strategy from the previous AWE. However, serious shortfalls existed for training documentation and guidance for performance training the digitally equipped force.

Table 2

Summary of Training Lessons Learned

Training Strategy
- Train to proficiency on combat fundamentals then train to digital proficiency before integrating into warfighting operations.
- Use a crawl-walk-run strategy with provisions for sustainment training in both conventional and digital operations.
- Integrate BOS and CA elements into digital training early and often as possible.
- Conducting individual digital skills training and staff processes weekly sustain higher levels of proficiency.
- Structured training packages enhance simulation training.

Training Management
- Identify new, modified, and unchanged tasks with the introduction of digital equipment.
- Integrate and incorporate new/modified tasks and procedures into training.
- Use battle-focused training management and procedures to plan, execute, and assess all unit training, i.e., FM 25-101, Battle Focused Training.
- Develop a digital METL and battle tasks early to drive training in digitally equipped units.
- Apply new training technologies to assist managing and executing unit training.

(Table Continues)

Training Methods
- Training technologies and programs need to be explained as to where they fit into unit training programs.
- Digital system emulation SW must functionally replicate the current HW functions and SW version of the real system.
- Self-paced training methods are preferred over the group-paced method.
- Computer-based tutorials are a preferred self-paced method for initial digital training; paper-based programmed text the least preferred method.
- Introductory training and instruction manuals should accompany all self-paced training equipment.
- Group-paced training with digital equipment (or with emulations) have the advantage of on-site instructors for questions and for pacing the class.

Prerequisite Skills and Knowledge
- Basic computer literacy knowledge would be helpful for digital operations.
- Train overall digital C2 architecture for the unit.
- Level of digital knowledge and skill requirements may be dependent on sophistication of the digital system, its interface, and the operator's entry level position in the unit.
- Information management skills need to be trained.
- Keyboarding skills are needed to improve efficiency and assist situational awareness.

Digital Learning Center
- A DLC is a key training environment for executing a unit's digital training strategy.
- A DLC provides flexibility to conduct individual through TF level training plus vertical and horizontal BOS training.
- A DLC provides the unit environment to sustain perishable digital skills through hands-on training.
- Establish a DLC training coordinator to be responsible for training and security.
- Establish weekly unit training schedules for using the DLC.
- Provide regular classroom equipment for traditional platform training and briefings.
- Provide computer WSs for self-paced tutorials and for conducting hands-on system emulation capabilities and team training.
- Increase realism by constructing mock-ups of C2 vehicles and other host vehicle platforms to simulate use of actual platforms.

Simulation Training
- Virtual and constructive simulation training is significantly enhanced with structured training.

(Table Continues)

- To achieve multi-echelon and BOS integration training include CS and CSS elements with simulation training.
- Conduct orientation training about limitations, capabilities, and differences of and between simulations, simulators, WSs and actual equipment prior to conducting simulation exercises.
- Maintain fidelity of digital equipment layout according to actual vehicular layout to provide realistic training.
- Develop workarounds for digital operation problems or loss of function to continue training during exercises.
- Conduct all phases of missions, planning through reorganization, to allow all unit CA, CS, and CSS elements to participate.
- Use trained O/Cs to monitor and evaluate training if possible.
- Provide enough digital equipment for all key unit elements to participate digitally in large unit exercises to enhance integration and synchronization of all BOS elements.

Training Literature
- Continue development of digital doctrinal literature with emphasis on more CA approaches.
- Decrease unit training burdens by developing task-based training literature for individual through collective training.
- Develop tasks, conditions, and standards to provide for performance based training.
- Develop additional materials such as generic digital tactical SOP and TTP books for specialty Plt operations.
- Survey proponent schools for existence of digital related literature.

Training Assessment
- External O/Cs need to be knowledgeable and proficient on digital equipment before conducting training assessment of digital units.
- Digital training is critical for O/C personnel.
- The future of training assessment for digitized units is linked with the development of standard digital equipment, verified doctrine, and training tasks with associated training materials, i.e., T&EOs.
- Structured evaluation materials need to be created that are compatible with, and have standards for, digital operations.

Training Support
- Acquire enough digital equipment to support individual through collective training with key unit C2 and support elements.
- Simulate C2 vehicle layouts during virtual and constructive exercises until using actual C2 vehicles in field exercises.
- If adequate digital equipment resources are unavailable, conduct vertical and horizontal slice training with BOS elements to train unit integration and synchronization.

Table Continues)

- Ensure contractor personnel will support initial digital equipment and all HW, SW, and terrain database updates with training.
- Additional support personnel may be required at the Bn level to support digital operations, networks, and training.
- PLL may need to include digital equipment components for immediate operator repairs to maintain digital operations in the field.

The previous section detailed many training lessons learned and derived implications for future training, especially training for digitally equipped units. For ease of use for the reader, Table 2 above and Table 3 below contain condensed summaries of training lessons learned and implications for future training, respectively. Both tables contain condensed information organized by the following nine categories: (a) training strategy, (b) training management, (c) training methods, (d) prerequisite skills and knowledge, (e) digital learning center, (f) simulation training, (g) training literature, (h) training assessment, and (i) training support.

Table 3

Summary of Implications for Future Training

Training Strategy
- Train individuals, teams, and unit to proficiency in combat fundamentals then digital proficiency using a variety of simulations.
- Develop progressively structured training strategies with clear proficiency criteria (gates) for use in individual, team, and unit training for both conventionally and digitally equipped forces.
- Integrate ARI-sponsored SIMUTA-based digital training support packages/programs into Force XXI unit training, i.e., SIMUTA-D.
- Adapt ongoing ARI-sponsored training research technology programs for Force XXI command and staff training, i.e., ITTBBST.

Training Management
- Involve proponent schools training developers in future Force XXI experimentation, especially in front-end functional task analyses for digitized forces.
- Use a notional digital METL as a starting point and modify, i.e., such as the AWE FD Bn TF METL-D.

(Table Continues)

- Use and test the latest SATS technology for Force XXI unit training management.

Training Methods
- Ensure CBI is intelligent computer assisted instruction and structured with sequential and progressively advanced lessons, i.e., similar to IVIS-ICAT.
- Ensure tutorial SW (a) is interactive, (b) is adaptable to different levels of user expertise, (c) has on-line help and feedback, (d) includes diagnostic and remediation capabilities, (e) has proficiency gates for advancement, and (f) contains record keeping functions to track user progress.
- Ensure digital emulation system SW has networking capability for group training applications.
- Develop T2 packages to include PEs for working with groups using networked emulations of digital equipment.
- Employ chain of command motivational strategies with any self-paced training to insure progression of individuals toward unit training goals.
- Field digital equipment emulation and tutorial SW with digital equipment to provide an initial individual training and sustainment capability for the unit.

Prerequisite Skills and Knowledge
- Teach basic computer literacy skills in initial leadership courses for enlisted personnel.
- Train basic digital systems, their use, and how they are used for specific MOS/SC, rank, and duty position in the institution.
- Institute training of digital systems architecture and system functionality geared to MOS/SC at levels needed in leadership courses first.
- Establish a digital systems course geared toward soldiers identified to report to digitized units, i.e., like a TC3 course.
- Conduct initial training or NET on digital equipment when the unit receives the equipment.
- Use off-the-shelf commercial touch typing tutorial SW in units to train, sustain, and enhance keyboarding skills.
- Develop IMEXs and a system to conduct the exercises for schools and units (Winsch et al, 1994).
- Develop intuitive computer interfaces (e.g., Windows) for digital systems to reduce initial and sustainment training needs.
- Develop color coded digital architecture job aids.

Digital Learning Center
- Establish a DLC at Bn levels to ensure sustainment training of highly perishable digital skills.
- Provide WSs to use accurate digital system emulations and provide capabilities to interface the WS with real radios for interacting with real digital systems.

(Table Continues)

- Provide a Janus SW capability to serve as a driver for leader and staff training.
- Develop and field structured training support packages with proficiency gates and T2 materials to assist unit trainers in executing and assessing training.
- Provide information management training technology for DLCs, i.e., such as IMEX technology.

Simulation Training
- Develop and apply structured training support packages for digitally equipped units, i.e., ARI-sponsored SIMUTA-D packages.
- Continue developing structured training packages for conventionally equipped units, i.e., ARI-sponsored COBRAS and COBRAS II training support packages.
- Investigate developing technology to integrate digital emulations or equipment into simulation environments.
- Provide technology and tools for O/Cs to monitor and capture digital traffic and information exchange for assessments.
- Investigate integrating digital equipment with simulation and digital emulation with radio equipment to support digital training.
- Investigate various simulation combinations (hybrids) for simulating larger scale training with fewer resources.

Training Literature
- Involve proponent training developers in the Force XXI process to develop approved training materials and guidance.

Training Assessment
- Develop SIMUTA-based training packages that include assessment materials and O/C T2 materials.
- Track efforts to identify and stabilize digitally trained and experienced SMEs for O/C teams to ensure a capability to conduct Force XXI training assessments in the near to mid term future.
- Investigate methods to rapidly train and develop O/Cs qualified to evaluate digitized units.

Training Support
- Conduct coordination efforts early to obtain needed quantities of digital equipment for supporting training, especially for scarce C2 resources like ASAS.
- Secure high-end WS with appropriate technical support to support a DLC.
- Acquire, if possible, multimedia Laptop PCs to support self-paced training technologies.
- Investigate adding automation officers with support personnel at the Bn level to support digital and network operations, conduct digital training, and possibly manage the DLC.
- Investigate the effect on PLL resulting from supporting digital equipment on platforms.

References

BBN Systems and Technologies Corp. (1991). SIMNET-D data collection and analysis system. Cambridge, MA: Author.

BDM Federal, Inc. (1995). Innovative tools and technologies for brigade and below staff training (ITTBBST) research plan. Albuquerque, NM: Author.

Campbell, C. H., Campbell, R. C., Sanders, J. J., Flynn, M. R., and Myers, W. E. (1995). Methodology for the development of structured simulation-based training (ARI Research Product 95-08). Alexandria, VA: U.S. Army Research Institute for the Behavioral and Social Sciences.

Du Bois, R. S., & Smith, P. G. (1989). A simulation-based evaluation of a position navigation system for armor: Soldier performance, training, and functional requirements (ARI Technical Report 834). Alexandria, VA: U.S. Army Research Institute for the Behavioral and Social Sciences. (AD A21 696)

Human Resources Research Organization (1994). Research plan for Force XXI training program for the conventional brigade. Alexandria, VA: Author.

Jensen, M. (1995, January-March). ASAS arrives. Military Intelligence, pp. 29-33.

Kollhoff, R. K. (1995, September-October). Digitization will impact many areas of training. Armor, pp. 41-43.

Kristiansen, D. M. and Witmer, R. G. (1981). Guidelines for conducting a training program evaluation (TPE) (ARI Research Product 81-18). Alexandria, VA: U.S. Army Research Institute for the Behavioral and Social Sciences. (AD A120 775)

Leibrecht, B. C., Winsch, B. J., Ford, L. A., F. M., Sawyer, A. S., Meade, J. A., Ainslie, F. M., Smith, P. G., Sever, R. S., & Doherty, W. J. (1993). Battalion evaluation of the combat vehicle command and control system in distributed interactive simulation: Preliminary findings (ARI Technical Report 992). Alexandria, VA: U.S. Army Research Institute for the Behavioral and Social Sciences. (AD A275 912)

Maggart, L. E. (1994, November-December). Window to the future. Army Research, Development, and Acquisition Bulletin, pp. 12-13.

Marlin, D. W. (1995, August). Warfighter XXI: The army's future training strategy. Paper presented at Warfighter Conference 2, Lawrence, KS.

Miller, D. C., & Chung, J. W. (1987). SIMNET-D capabilities and overview. Cambridge, MA: Bolt, Beranek, and Newman Laboratories, Inc.

National Aeronautics and Space Administration (1995). IVIS ICAT: Intervehicular information system intelligent computer aided trainer user's guide. Houston, TX: Lyndon B. Johnson Space Center. (Available from National Aeronautics and Space Administration, Software Technology Branch, Information Systems Directorate, Lyndon B. Johnson Space Center, Houston, TX 77058.)

Norris, A. and Reese, K. (1993, July-September). Warrior: The future intelligence picture -- now. Military Intelligence, pp. 19-22, 40.

O'Brien, L. H., Wigginton, D., Morey, J. C., Leibrecht, B. C., Ainslie, F. M., & Sawyer, A. R. (1992). Combat vehicle command and control battalion-level preliminary evaluation (ARI Research Report 1627). Alexandria, VA: U.S. Army Research Institute for the Behavioral and Social Sciences. (AD A257 467)

Shneiderman, B. (1992). Designing the user interface: Strategies for effective human-computer interaction. Reading, MA: Addison-Wesley Publishing Company.

SPSS, Inc. (1995). SPSS for Windows (Release 6.1.2) [Computer Software]. Chicago, IL: Author.

Sullivan, G. R. (1994, November-December). Force XXI: Digitizing the battlefield. Army Research, Development, and Acquisition Bulletin, pp. 2-3.

Toffler, A. and Toffler, H. (1993). War and anti-war: Survival at the dawn of the 21st century. Boston, MA: Little, Brown and Company.

Turecek, J. L., Campbell, C. H., Myers, W. E., and Garth, T. H. (1995). Reserve component virtual training program orientation guide (ARI Research Product 95-07). Alexandria, VA: U.S. Army Research Institute for the Behavioral and Social Sciences.

U.S. Army Armor Center (1990). The 12th cavalry regiment combined arms tactical training center (CATTC) users' guide. Fort Knox, KY: Author. (Available from the Commander, U.S. Army Armor Center and Fort Knox, ATTN: ATSB-SBE, Fort Knox, KY 40121-5200.)

U.S. Army Armor Center (1994). Advanced warfighting experiment: Operation desert hammer VI. Fort Knox, KY: Author. (Available from the Commander, U.S. Army Armor Center and Fort Knox, ATTN: ATZK-PTF-D, Fort Knox, KY 40121-5200.)

U.S. Army Armor Center (1995a). Battle lab experimentation plan for advanced warfighting experiment: Focused dispatch, draft. Fort Knox, KY: Author. (Available from the Commander, U.S. Army Armor Center and Fort Knox, ATTN: ATZK-PTF-D, Fort Knox, KY 40121-5200.)

U.S. Army Armor Center (1995b). Force XXI: Creating the force of the 21st century [Slides]. Fort Knox, KY: Author. (Available from the Commander, U.S. Army Armor Center and Fort Knox, ATTN: ATZK-MW, Fort Knox, KY 40121-5200.)

U.S. Army Armor Center (1995c). Joint visitors bureau briefing [Slides]. Fort Knox, KY: Author. (Available from the Commander, U.S. Army Armor Center and Fort Knox, ATTN: ATZK-MW, Fort Knox, KY 40121-5200.)

U.S. Army Armor School (1995a). Janus battle simulation exercise - memorandum of instruction (MOI), 1 February 1995. Fort Knox, KY: Author. (Available from the Commander, U.S. Army Armor Center and Fort Knox, ATTN: ATSB-SBE-BJ, Fort Knox, KY 40121-5200.)

U.S. Army Armor School (1995b). Special text 71-1-1 (revised draft): Tactics and techniques for the digitized company team. Fort Knox, KY: Author. (Available from the Commander, U.S. Army Armor Center and Fort Knox, ATTN: ATZK-DS, Fort Knox, KY 40121-5200.)

U.S. Army Armor School (1995c). Special text 71-2-2 (revised draft): Tactics and techniques for the digitized battalion task force. Fort Knox, KY: Author. (Available from the Commander, U.S. Army Armor Center and Fort Knox, ATTN: ATZK-DS, Fort Knox, KY 40121-5200.)

U.S. Army Armor School (1995d). Task force 2-33 armor: Digital learning center microstrategies. Fort Knox, KY: Author. (Available from the Commander, U.S. Army Armor Center and Fort Knox, ATTN: ATSB-SBF, Fort Knox, KY 40121-5200.)

U.S. Army Research Institute for the Behavioral and Social Sciences (1995). FY96 science and technology work program (Draft). Alexandria, VA: Author.

U.S. Department of the Army (1995a). Army Focus 94: Force XXI...America's army of the 21st century [Brochure]. Fort Monroe, VA: Author. (Available from the Office of the Chief of Staff, Army, ATTN: DACS-LM, Fort Monroe, VA 23651-5000.)

U.S. Department of the Army (1995b). Army tactical command and control system: Brigade and below command and control (B2C2) computer system operator's software user's manual (Draft). Fort Monmouth, NJ: Program Executive Office Command and Control Systems. (Available from Program Executive Office, Command and Control Systems, ATTN: SFAE-CC, Fort Monmouth , NJ 07703-5401.)

U.S. Department of the Army (1995c). The army training information management program (ATIMP). Fort Eustis: Author.

U.S. Department of the Army (1995d). Battle labs force XXI: Defining the future [Brochure]. Fort Monroe, VA: Author. (Available from the Commander, U.S. Army Training and Doctrine Command, ATTN: ATCD-B, Fort Monroe, VA 23651-5000.)

U.S. Department of the Army (1995e). Joint Venture Campaign Plan (Draft). Fort Monroe, VA: Author.

U.S. Department of the Army (1995f). Technical manual 9-2350-288-10-1: Operator's manual, operator controls, PMCS, and operations under usual conditions, tank, combat, full-tracked: 120-mm gun, M1A2. Warren, MI: Author. (Available from the Commander, Tank-automotive and Armaments Command, ATTN: AMSTA-NMAA, Warren, MI 48397-5000.)

U.S. Department of the Army (1995g). TRADOC Pamphlet 525-69: Concept for information operations. Fort Monroe, VA: Author. (Available from the Commander, U.S. Army Training and Doctrine Command, ATTN: ATCD-BP, Fort Monroe, VA 23651-5000.)

U.S. Department of the Army (1994a). Army science and technology master plan. Washington, D.C.: Author. (Available from Headquarters, Department of the Army, Deputy Assistant Secretary for Research and Technology, ATTN: SARD-ZT, Washington, D.C. 20310-0103.)

U.S. Department of the Army (1994b). TRADOC Pamphlet 525-5 (Draft): Force XXI operations: A concept for the evolution of full-dimensional operations for the army of the early twenty-first century. Fort Monroe, VA: Author.

U.S. Department of the Army (1993). Technical manual 11-7025-317-10-1: Operator's manual for initial fire support automated system (IFSAS). Fort Monmouth, NJ: U.S. Army Communications Command.

U.S. Department of the Army (1990a). FM 25-101: Battle focused training. Fort Leavenworth, KS: Author. (Available from Commander, U.S. Army Combined Arms Center and Fort Leavenworth, Attn: ATZL-GOP-SE, Fort Leavenworth, KS 66027-5070.)

U.S. Department of the Army (1990b). TRADOC pamphlet 351-13: Systems approach to training - analysis. Fort Monroe, VA: Author. (Available from the Commander, U.S. Army Training and Doctrine Command, ATTN: ATTG-C, Fort Monroe, VA 23651-5000.)

U.S. Department of the Army (1988). FM 71-2: The tank and mechanized infantry battalion task force. Fort Benning, GA: Author. (Available from Commandant, U.S. Army Infantry School, ATTN: ATSH-B, Fort Benning, GA 31905-5410.)

Way, R. D. (1993). Intelligent tutoring and training white paper. Houston, TX: National Aeronautics and Space Administration. (Available from National Aeronautics and Space Administration, Software Technology Branch, Information Systems Directorate, Lyndon B. Johnson Space Center, Houston, TX 77058.)

Winsch, B. J., Atwood, N. K., Sawyer, A. R., Quinkert, K. A., Heiden, C. K., Smith, P. G., & Schwartz, B. (1994). Innovative training concepts for use in distributed interactive simulation environments (ARI Research Product 94-16). Alexandria, VA: U.S. Army Research Institute for the Behavioral and Social Sciences. (AD A285 585)

Witmer, R. G. (1981). A job aid for the structured observation of training (ARI Research Product 81-16). Alexandria, VA: U.S. Army Research Institute for the Behavioral and Social Sciences. (AD A120 773)

Appendix A

Acronym List

A&L	Administrative and Logistics
AAR	After Action Review
ADA	Air Defense Artillery
AFATDS	Advanced Field Artillery Tactical Data System
ANCOC	Advanced Non-Commissioned Officer's Course
AOAC	Armor Officer's Advanced Course
AR	Armor
ARI	Army Research Institute
ARPA	Advanced Research Projects Agency
ARTEP	Army Training and Evaluation Program
ASAS	All Source Analysis System
ATCCS	Army Tactical Command and Control System
ATIMP	Army Training Information Management Program
AWE	Advanced Warfighter Experiment
B2C2	Brigade and Below Command and Control
BAS	Battalion Aid Station
BCV	Battle Command Vehicle
Bde	Brigade
BFV	Bradley Fighting Vehicle
BICC	Battlefield Intelligence Collection Cell
BLEP	Battle Lab Experiment Plan
BLUFOR	Blue Force (Friendly Force)
BLWE	Battle Lab Warfighting Experiment
BMO	Battalion Maintenance Officer
BMP	(Bronevaya Maschina Piekhota) Russian amphibious armored infantry combat vehicle
Bn	Battalion
BNCOC	Basic Non-Commissioned Officer's Course
BOS	Battlefield Operating Systems
BSFV	Bradley Stinger Fighting Vehicle
BSTS	Battle Staff Training System
C/ST	Commander/Staff Trainer
C2	Command and Control
C2V	Command and Control Vehicle
CA	Combined Arms
CATS	Combined Arms Training Strategy
CATTC	Combined Arms Tactical Training Center
CB	Citizen's Band
CBI	Computer Based Instruction
Cdr	Commander
CESO	Communications and Electronics Signal Officer
CFF	Call For Fire
CFV	Cavalry Fighting Vehicle
CGSC	Command and General Staff College
CID	Commander's Integrated Display
CMTC	Combat Maneuver Training Center
Co	Company
Co/Tm	Company Team
COA	Course of Action
COBRAS	Combined Arms Operations at Brigade Level, Realistically Achieved Through Simulation
COMMEX	Communication Exercise

CONUS	Continental United States
CP	Command Post
CPX	Command Post Exercise
CRP	Combat Reconnaissance Patrol
CS	Combat Support
CSS	Combat Service Support
CTCP	Combat Trains Command Post
DATK	Deliberate Attack
DCA	Data Collection and Analysis
DCD	Directorate of Combat Development
DID	Driver's Integrated Display
DIS	Defense in Sector
DLC	Digital Learning Center
DTLOMS	Doctrine, Training, Leader Development, Operations, Material, and Soldiers
EXFAC	Experiment Facilitator
EXFOR	Experimental Force
FA	Field Artillery
FD	Focused Dispatch
FED	Forward Entry Device
FIST	Fire Integration Support Team
FRAGO	Fragmentary Order
FSE	Fire Support Element or Forward Security Element
FSO	Fire Support Officer
FTCP	Field Trains Command Post
FTX	Field Training Exercise
GCDP	Gunner's Control and Display Panel
GPS	Global Positioning System
GTA	Graphic Training Aid
HATK	Hasty Attack
HHC	Headquarters and Headquarters Company
HMMWV	High Mobility Multi-Purpose Wheeled Vehicle
HQ	Headquarters
HW	Hardware
ICAT	Intelligent Computer Aided Trainer
ICOM	Integrated Communication
IEW	Intelligence and Electronic Warfare
IFSAS	Initial Fire Support Automated System
IMEX	Information Management Exercise
IPB	Intelligence Preparation of the Battlefield
ITTBBST	Innovative Tools and Techniques for Brigade and Below Staff Training
IVIS	Intervehicular Information System
LAN	Local Area Network
LCU	Lightweight Computer Unit
LOGEX	Logistical Exercise
LOS	Line of Sight

LRP	Logistics Release Point
LTACFIRE	Lightweight Tactical Fire Direction System
MAJ	Major
MBBL	Mounted Battlespace Battle Lab
MCC	Management, Command, and Control
METL	Mission Essential Task List
MI	Military Intelligence
MILES	Multiple Integrated Laser Engagement System
MODSAF	Modular Semi-Automated Forces
MOP	Measures of Performance
MOPP	Mission Oriented Protective Posture
MOS	Military Occupational Specialty
MRB	Motorized Rifle Battalion
MTC	Movement to Contact
MTP	Mission Training Plan
MTS	Movement Tracking System
MWSTC	Mounted Warfighting Simulation Training Center
MWTB	Mounted Warfare Test Bed
NASA	National Aeronautics and Space Administration
NBC	Nuclear, Biological, and Chemical
NCO	Non-Commissioned Officer
NET	New Equipment Training
NTC	National Training Center
O/C	Observer/Controller
O&I	Operations and Intelligence
O&O	Organization and Operation
OAC	Officer's Advanced Course
OBC	Officer's Basic Course
OOTW	Operations Other Than War
OPFOR	Opposing Force
OPORD	Operations Order
PC	Personal Computer
PE	Practical Exercise
PL	Platoon Leader
PLL	Prescribed Load List
PMCS	Preventive Maintenance, Checks, and Services
POI	Program of Instruction
POSNAV	Position Navigation
PSG	Platoon Sergeant
PVD	Plan View Display
RCVTP	Reserve Component Virtual Training Program
SAFOR	Semi-Automated Forces
SATS	Standard Army Training System
SATS-TREDS	Standard Army Training System-Training Exercise Development System
SC	Specialty Code
SGT	Sergeant

SIMNET	Simulation Network
SIMNET-D	Simulation Network-Developmental
SIMUTA	Simulation-Based Multi-Echelon Training for Armor Units
SIMUTA-D	Simulation-Based Multi-Echelon Training for Armor Units-Digital
SINCGARS	Single Channel Ground to Air Radio System
SME	Subject Matter Expert
SMI	Soldier-Machine Interface
SOP	Standing Operating Procedure
SPSS	Statistical Package for Social Sciences
SRM	SINCGARS Radio Model
ST	Special Text
STO	Science and Technology Objective
STRICOM	Simulation Training and Instrumentation Command
SW	Software
T&EO	Training and Evaluation Outline
T2	Train the Trainer
TACFIRE	Tactical Fire Direction System
TACSOP	Tactical Standing Operations Procedure
TADSS	Training Aids, Devices, Simulators, and Simulations
TC	Tank Commander
TC3	Tank Commander's Certification Course
TCIM	Tactical Communications Interface Module
TDA	Table of Distribution and Allowances
TEO	Training Evaluation Outline
TF	Task Force
TLP	Troop Leading Procedure
TM	Technical Manual
TO&E	Table of Organization and Equipment
TOC	Tactical Operations Center
TRADOC	Training and Doctrine Command
TTCC	Tank Tactical Control Center
TTP	Tactics, Techniques, and Procedures
UAV	Unmanned Aerial Vehicle
UCOFT	Unit Conduct of Fire Trainer
UMCP	Unit Maintenance Collection Point
VCR	Video Cassette Recorder
VS1	Virtual Simulation 1
WFXXI	Warfighter XXI
WKTA	Western Kentucky Training Area
WS	Workstation
XO	Executive Officer

Appendix B

Data Collection Instruments

Contents of Appendix B:

BATTALION TASK FORCE
DEMOGRAPHIC SURVEY

NAME: _____ SOCIAL SECURITY NUMBER: _____

1. SC/MOS: _____ 2. Rank/Grade: _____

3. Time in Military Service: Years _____ Months _____

4. Time in Armor MOS/SC: Years _____ Months _____

5. When did you report to TF 2-33: Year ____ Month _____

6. Circle your current TF 2-33 duty position:

Loader Driver Gunner Tank Cdr Plt Sgt Plt Ldr Spec Plt Ldr Co XO Co Cdr

S1 S2 S3 S3 Air S4 BICC FSO ENG NBC ADA CESO Other:_____

7. Prior to reporting to TF 2-33 *(or as of 1 Feb 95; start of the Focused Dispatch AWE training)*, how much experience did you have in the following TO&E (combat maneuver unit) positions?

a. Loader	_____/_____ yrs mos	h. Co XO	_____/_____ yrs mos	o. BICC	_____/_____ yrs mos
b. Driver	_____/_____ yrs mos	i. Co Cdr	_____/_____ yrs mos	p. FSO	_____/_____ yrs mos
c. Gunner	_____/_____ yrs mos	j. Bn S1	_____/_____ yrs mos	q. ENG	_____/_____ yrs mos
d. Tank Cdr	_____/_____ yrs mos	k. Bn S2	_____/_____ yrs mos	r. NBC	_____/_____ yrs mos
e. Plt Sgt	_____/_____ yrs mos	l. Bn S3	_____/_____ yrs mos	s. ADA	_____/_____ yrs mos
f. Plt Ldr	_____/_____ yrs mos	m. Bn S3 Air	_____/_____ yrs mos	t. CESO	_____/_____ yrs mos
g. Spec Plt Ldr	_____/_____ yrs mos	n. Bn S4	_____/_____ yrs mos	u. _____ Other	_____/_____ yrs mos

8a. How many times have you participated as a member of a rotating unit at NTC or CMTC?
_____ times

8b. What was your duty position(s) at NTC or CMTC? (Circle all that apply.)

Loader Driver Gunner Tank Cdr Plt Sgt Plt Ldr Spec Plt Ldr Co XO Co Cdr

S1 S2 S3 S3 Air S4 BICC FSO ENG NBC ADA CESO Other:_____

9. As of 1 Feb 95, in which of the following SIMNET-D (MWTB) equipment evaluations have you participated? (Check all that apply.)

a. ____ POSNAV b. ____ IVIS c. ____ CITV d. ____ CVCC (Co level)

e. ____ CVCC (Bn level) f. ____ CVCC (Bn TOC) g. ____ Hollis Test

h. ____ BSD i. ____ X-ROD j. ____ VIDS k. ____ Other (list) _____

l. ____ None

10. As of 1 Feb 95, how much SIMNET training experience did you have? (Circle one please.)

0 hours 1-8 hours 9-16 hours 17-24 hours +24 hours (specify) _____

11. As of 1 Feb 95, how many JANUS training exercises had you participated in?
Number of exercises: _____

12. As of 1 Feb 95, had you trained and/or had experience with any of the digital equipment you trained with or used in this experiment? Please list by type (i.e., B2C2, IVIS, ASAS), training received and/or experience, and dates. _____
_____
_____
_____

13a. As of 1 Feb 95, check your level of previous experience with computers. (Do not count SIMNET-T, SIMNET-D, or JANUS experience.)

____ No experience at all

____ Limited experience (i.e., limited word processing or computer games)

____ Moderate experience (i.e., some programming experience or some use of commercial computer programs)

____ Considerable experience (i.e., fluent in more than one programming language or extensive experience using commercial programs such as spreadsheets)

13b. As of 1 Feb 95, if you related your experience with computers in terms of years, where would you place yourself on the chart below? (Circle a number please.)

1	2	3	4	5
No Experience	less than 1 year	more than 1 year	more than 3 years	5 years or more

13c. Approximately how often did you use a computer each month prior to 1 Feb 95? (Circle a number please.)

1	2	3	4
Never	Once a week	2-3 times per week	Daily

13d. Approximately how often have you used a computer each month since reporting to TF 2-33 or after 1 Feb 95? Do not count time with the digital equipment (i.e., IVIS, ASAS, B2C2, etc.) used in training and the Focused Dispatch experiment. (Circle a number please.)

1	2	3	4	5
Never	Once a month	Once a week	2-3 times per week	Daily

13e. Prior to 1 Feb 95, had you used Windows (or a Windows-type software) while using a computer? (Check one please.)

____ Yes ____ No

13f. People commonly report feeling uncomfortable using computers. Please circle below the value that best describes how you feel (in general) about using computers.

1	2	3	4	5
Very Uncomfortable	Uncomfortable	Neutral	Comfortable	Very Comfortable

14. Please check your highest civilian education level achieved:

____ High school diploma/GED

____ Some college

____ College degree (BA/BS)

____ Postgraduate work

____ Graduate degree (MA/MS)

____ Post Master's degree work

15. Please describe any additional factors (positive and negative) that may have affected your performance with the digital equipment used in Focused Dispatch training and/or the Live-Virtual experiment:

Positive Factors: _____

_____

_____

_____

Negative Factors: _____

_____

_____

_____

BATTALION TASK FORCE TRAINING QUESTIONNAIRE

Name:_____ **Social Security Number:**_____

Digital system(s) operated during Virtual/Live experiment during August 1995: (Circle system(s))

IVIS **B2C2** **ASAS** **IFSAS** **Other:**_____

PART I - EQUIPMENT TRAINING: Listed below are training elements and functions that are considered important in understanding training of digital systems used in Focused Dispatch Advanced Warfighting Experiment. Please indicate which digital system(s) you were trained to operate by *circling* the acronym of the system (or *writing* in the acronym in the blank provided after "**Other**". *Rate your primary operating system first then a second system if applicable.* Please circle the number that represents your impressions about learning to operate and use the system. Not Applicable = N/A. An area for written comments is provided following the rating scale section.

Primary: IVIS ASAS Other:_____ B2C2 IFSAS

A. Learning to operate the system (overall)	1	2	3	4	5	N/A	
	Difficult				Easy		
B. Power up/down system	1	2	3	4	5	N/A	
	Difficult				Easy		
C. Log on/off procedures	1	2	3	4	5	N/A	
	Difficult				Easy		
D. Net control station tasks	1	2	3	4	5	N/A	
	Difficult				Easy		
E. Creating/Sending reports	1	2	3	4	5	N/A	
	Difficult				Easy		
F. Relaying reports	1	2	3	4	5	N/A	
	Difficult				Easy		
G. Creating/Sending overlays	1	2	3	4	5	N/A	
	Difficult				Easy		
H. Editing overlays	1	2	3	4	5	N/A	
	Difficult				Easy		
I. Using map functions (scrolling, etc.)	1	2	3	4	5	N/A	
	Difficult				Easy		
J. Learning advanced features	1	2	3	4	5	N/A	
	Difficult				Easy		
K. Time to learn system	1	2	3	4	5	N/A	
	Slow				Fast		
L. Remembering names and use of commands	1	2	3	4	5	N/A	
	Difficult				Easy		
M. Remembering specific rules about entering commands	1	2	3	4	5	N/A	
	Difficult				Easy		
N. Could tasks be performed in a straight forward way	1	2	3	4	5	N/A	
	Never				Always		
O. Accessing help messages	1	2	3	4	5	N/A	
	Difficult				Easy		
P. Content of help messages	1	2	3	4	5	N/A	
	Confusing				Clear		

Secondary: IVIS ASAS Other:_____ B2C2 IFSAS

A. Learning to operate the system (overall)	1	2	3	4	5	N/A	
	Difficult				Easy		
B. Power up/down system	1	2	3	4	5	N/A	
	Difficult				Easy		
C. Log on/off procedures	1	2	3	4	5	N/A	
	Difficult				Easy		
D. Net control station tasks	1	2	3	4	5	N/A	
	Difficult				Easy		
E. Creating/Sending reports	1	2	3	4	5	N/A	
	Difficult				Easy		
F. Relaying reports	1	2	3	4	5	N/A	
	Difficult				Easy		
G. Creating/Sending overlays	1	2	3	4	5	N/A	
	Difficult				Easy		
H. Editing overlays	1	2	3	4	5	N/A	
	Difficult				Easy		
I. Using map functions (scrolling, etc.)	1	2	3	4	5	N/A	
	Difficult				Easy		
J. Learning advanced features	1	2	3	4	5	N/A	
	Difficult				Easy		
K. Time to learn system	1	2	3	4	5	N/A	
	Slow				Fast		
L. Remembering names and use of commands	1	2	3	4	5	N/A	
	Difficult				Easy		
M. Remembering specific rules about entering commands	1	2	3	4	5	N/A	
	Difficult				Easy		
N. Could tasks be performed in a straight forward way	1	2	3	4	5	N/A	
	Never				Always		
O. Accessing help messages	1	2	3	4	5	N/A	
	Difficult				Easy		
P. Content of help messages	1	2	3	4	5	N/A	
	Confusing				Clear		

Q. Amount of help in help messages	1	2	3	4	5	N/A	Q. Amount of help in help messages	1	2	3	4	5	N/A
	Inadequate				Adequate			Inadequate				Adequate	
R. Tutorials for beginners	1	2	3	4	5	N/A	R. Tutorials for beginners	1	2	3	4	5	N/A
	Confusing				Clear			Confusing				Clear	
S. Reference manuals	1	2	3	4	5	N/A	S. Reference manuals	1	2	3	4	5	N/A
	Confusing				Clear			Confusing				Clear	

Comments: If you have a comment related to a specific element, please indicate whether it is the primary or secondary system, list the letter of the element (A-S), and write the comment beside it in the space below.

PART II - INDIVIDUAL/STAFF TRAINING: This part of the questionnaire has five sections that ask detailed questions about possible individual training experiences you may have participated in from January to August 1995. During your training preparation in Focused Dispatch there were several training opportunities available for individual training. The training opportunities are listed with brief descriptions to jog your memory about a particular event. Listed within each training opportunity is a set of questions pertaining to training factors important for describing the training for that event. Please answer the questions within each event by checking the response categories and making written comments when appropriate.

Section A. New Equipment Training: M1A2 NET Training was conducted from 8 Jan to 9 Feb. The M1A2 NET team conducted this training mostly in Building 485 (Motor Pool). The training mainly consisted of introductory lessons (i.e., M1A2 familiarization, technical manuals, terminology, and M1A2 functions), task training for the different crew stations, IVIS and POSNAV training, and gunnery and crew exercises.

	YES	NO	N/A	COMMENTS
Did you participate in the training? (If you did not attend this class, check NO and skip to **Section B.**)				
Were the training objectives (tasks, conditions, and standards) clear?				
Were you made aware of the training schedule?				
Were enough trainers present to provide adequate assistance?				
Did you receive explanations of any new concepts, technology, and terms?				
Did you have individual access to training equipment (or actual equipment) during training?				
Was the equipment readily available when needed?				
Did the equipment work properly?				
Could you see and hear the instruction, demonstrations, briefings, etc?				

	YES	NO	N/A	COMMENTS
Was training interrupted (i.e., equipment breakdowns, delays due to weather, delays due to missing equipment, training aid malfunctions)?				
Was there enough time during training sessions?				
Was need-to-know information emphasized; nice-to-know minimized?				
Did training progress from simple to more difficult tasks?				
Were demonstrations of task performance provided?				
Were you allowed to individually practice hands-on with the equipment?				
Did you get to practice as much as you needed?				
Were you told what you were doing right or wrong during practice?				
Was feedback provided as soon as possible after practice?				
Were job aids given at the beginning of training?				
Were job aids accurate and helpful?				
Were training materials (technical manuals, workbooks, handouts, etc.) available, necessary, easy to follow and use?				
Were questions answered satisfactorily?				

	YES	NO	N/A	COMMENTS
Were you tested after training?				
Were test instructions and standards for pass/fail clear?				
Were you told what you did right or wrong on the tests?				
Were you given opportunities to go through remedial training?				

Section B. Tutorials: You had the opportunity to use at least three self-paced tutorials for initial digital training. These three tutorials used different self-paced training methods for initial skill training in operating the IVIS.

1. Laptop computer IVIS (version 1.9) *emulation software* for use with the Automated Tactical Reports *programmed text*.				
	YES	NO	N/A	COMMENTS
Did you train by using the Laptop Computer IVIS emulation software? (If you did not use, check NO and skip to **Question 2.**)				
Were the training objectives (tasks, conditions, and standards) clear?				
Were explanations of any new concepts, technology, and terms clear?				
Did you have adequate access to a computer when you wanted to use this software for training?				
Any equipment/software problems that limited the effectiveness of your training?				

	YES	NO	N/A	COMMENTS
Did this IVIS emulation software ever confuse you because the real IVIS looked or responded differently than the emulation software?				
Compared to other methods of IVIS training, was the IVIS software with lessons in programmed text good training?				
Was the addition of programmed text for guiding the IVIS software training a better approach than simply exploring the IVIS reporting functions on your own?				
Do you think this training was efficient compared to other IVIS training?				
Did you get to practice as much as you needed?				
Was training feedback sufficient?				
Was the programmed text easy to follow and use?				
Do you think the Army should invest in this type of training technology (laptop computers with software) for digital training?				

2. Automated Overlay Techniques and Digital Message Routing Matrix *programmed text.*				
	YES	NO	N/A	COMMENTS
Did you train using this programmed text? (If you did not use, check NO and skip to **Question 3.**)				
Were the training objectives (tasks, conditions, and standards) clear?				
Were explanations of any new concepts, technology, and terms clear?				
Compared to other methods of IVIS training, was training with programmed text good training?				
Do you think this training was efficient compared to other IVIS training?				
Was training feedback sufficient?				
Was the programmed text easy to follow and use?				
Do you think the Army should invest in stand-alone programmed text for digital training?				

3. IVIS Intelligent Computer Aided Trainer (ICAT) *courseware* on workstations in the TF 2-33 Learning Center.				
	YES	NO	N/A	COMMENTS
Did you train using the IVIS CAT courseware located in the TF 2-33 Learning Center? (If you did not use, check NO and skip to **Question 4.**)				

	YES	NO	N/A	COMMENTS
Were the training objectives (tasks, conditions, and standards) clear?				
Were explanations of any new concepts, technology, and terms clear?				
Did you have adequate access to the Learning Center workstation and ICAT courseware when you wanted to train?				
Any equipment/software problems that limited the effectiveness of your training?				
Did this IVIS ICAT emulation software ever confuse you because the real IVIS looked or responded differently than the emulation software?				
Compared to other methods of IVIS training, was the IVIS ICAT courseware good training?				
Was the interactive computer assisted instruction approach better than simply exploring the IVIS functions on your own?				
Do you think this training was efficient compared to other IVIS training?				
Did you get to practice as much as you needed?				
Was training feedback sufficient?				
Was the program easy to follow and use?				

	YES	NO	N/A	COMMENTS
Do you think the Army should invest in this type of training technology (interactive courseware) for digital training?				

4. Using the scale below, write the number beside each tutorial method indicating how much you think you learned compared with using the real equipment? Rate each tutorial by placing a number by the tutorial method. Write "N/A" in blanks beside the tutorial(s) you did not use.

1	2	3	4	5
Learned much more	Learned more	Learned about the same	Learned less	Learned much less

____ a. IVIS emulation software with programmed text

____ b. Programmed text only

____ c. ICAT courseware

Comment:_____

_____

_____

_____

5. In general, were self-paced tutorials effective in training you to operate the digital equipment? (Circle one.)

YES NO

Comment:_____

_____

_____

_____

Section C. Classroom Training. During your training preparation in Focused Dispatch there were at least two classroom training sessions available for groups. The classroom sessions are listed with brief descriptions. For each classroom session listed is a set of questions pertaining to training factors considered important for describing the training during that event. Please answer the questions listed under each event by checking and making written comments when appropriate. N/A = Not Applicable.

1. <u>Digital Tactics, Techniques, and Procedures (TTP) Overview Class (2 Feb)</u> This training occurred in Boudinot Hall, Classroom 4 with a morning and afternoon session. Two officers from the Doctrine Division of 16th Cav presented IVIS routing matrix, reports, overlays/graphics, net address concerns, digitization TTP overview of command and control, and videos of Force XXI operation. A shirt-pocket IVIS reference Guide was provided.

	YES	NO	N/A	COMMENTS
Did you participate in the training? (If you did not attend the classes, check NO and skip to **Question 2.**)				
Were the training objectives clear?				
Do you think the overview information about IVIS operations, nets, and TTPs helped prepare you for digital operations?				
Were the explanations of new concepts, technology, and terms adequate for understanding digital operations?				
Could you see and hear the instruction, briefings, videotape presentations, etc?				
Do you think training time was used efficiently?				
Was need-to-know information emphasized; nice-to-know minimized?				
Was the shirt pocket IVIS Reference Guide (routing matrix) accurate and helpful in later use?				

	YES	NO	N/A	COMMENTS
Were training materials (Special texts, workbooks, tutorial software, handouts, etc.) available, necessary, easy to follow and use?				
Were questions answered satisfactorily?				

2. B2C2 Operator Training Class (22-23 Feb) This training occurred in the Mounted Warfare Test Bed in a classroom layout with nine B2C2 LCUs and an overhead projector for guided group-paced hands-on training. Two double sessions were conducted for two days. A contractor instructed while three assistants helping with hands-on operations. Part I lessons included familiarization with B2C2, power-up and log-on procedures, and general message sending. Part II consisted of creating/sending messages, reports, and overlays, performing shut-down and recovery operations, and log-off procedures. Copies of users and technical manuals were provided.

	YES	NO	N/A	COMMENTS
Did you participate in the training? (If you did not attend this class, check NO and skip to **Question 3.**)				
Were the training objectives clear?				
Were enough trainers present to provide adequate assistance?				
Did the B2C2 class give you the basic skills needed to continue learning about the system on your own?				
Were the explanations of new concepts, technology, and terms adequate for understanding digital operations?				
Did you have hands-on access to B2C2 equipment during the training?				

	YES	NO	N/A	COMMENTS
Did the equipment function properly?				
Could you see and hear the instruction, demonstrations, briefings, etc?				
Was training interrupted (i.e., equipment breakdowns, training aid malfunctions, etc.)?				
Was there enough time during training sessions?				
Were training sessions and breaks adequate to keep you from becoming bored or fatigued?				
Do you think training time was used efficiently?				
Was need-to-know information emphasized; nice-to-know minimized?				
Did training progress from simple to more difficult tasks?				
Did the pace of training allow you to practice the demonstrated tasks?				
Were you allowed to individually practice hands-on with the equipment?				
Did you get to practice as much as you needed?				
Were you told what you were doing right or wrong during practice?				
Were your mistakes identified and were you allowed to correct your performance?				

	YES	NO	N/A	COMMENTS
Were job aids given at the beginning of training?				
Were job aids accurate and helpful?				
Were training materials (technical and users manuals and handouts) available, necessary, easy to follow and use?				
Were questions answered satisfactorily?				
Were you given opportunities to go through remedial training?				
Given what you know now about digital operations, was there information missing that would have been useful to you during your follow-on training?				

3. Did you attend classroom sessions other than the ones listed here? (Circle one.)

YES NO

If Yes, please list, give approximate dates, and short description of subjects/lessons:

_____

_____

_____

4. In general, were classroom sessions effective in training you in digital operations? (Circle one.)

YES NO

Comment:_____

_____

_____

Section D. IVIS Hands-On Training (7-9 Feb): This hands-on IVIS (version 2.3.2) training was conducted in Building 485 (Motor Pool) with a stand-alone IVIS and SINCGARS and an M1A2 tank. The training mainly consisted of hands-on training of the IVIS functions and procedures (i.e., startup/shutdown, menu familiarization, reports, overlays, etc.). Training was conducted by an M1A2 NET team instructor.

	YES	NO	N/A	COMMENTS
Did you participate in the training? (If you did not attend this class, check NO and skip to **Section E.**)				
Were the training objectives (tasks, conditions, and standards) clear?				
Did you have individual access to training equipment (or actual equipment) during training?				
Could you see and hear the instruction?				
Was training interrupted (i.e., equipment malfunctions)?				
Was there enough time during training sessions?				
Do you think training time was used efficiently?				
Was need-to-know information emphasized; nice-to-know minimized?				
Did training progress from simple to more difficult tasks?				
Were you allowed to individually practice hands-on with the equipment?				
Did you get to practice as much as you needed?				

	YES	NO	N/A	COMMENTS
Were you told what you were doing right or wrong during practice?				
Were job aids provided?				
Were job aids accurate and helpful?				
Did you have to create your own job aid materials (i.e., cheat sheets, procedure notes, etc.)?				
Were training materials (technical manuals, handouts, etc.) available, necessary, easy to follow and use?				
Were questions answered satisfactorily?				
Were you tested after training?				
Were test instructions and standards for pass/fail clear?				
Were you told what you did right or wrong on the tests?				
Were you given opportunities to go through remedial training?				
Was training and testing safely conducted?				
Did you feel you developed the necessary skills to operate the system?				

Section E. SATS-TREDS and JANUS Simulation Practical Exercise Training (8 - 12 May: This team training was conducted in TF 2-33 Learning Center by MAJ Stone, a graduate student from University of Central Florida. Participants were divided into pairs for doing the practical exercises. All participants received training in two phases: developing a battalion training plan and developing a JANUS simulation training exercise. Developing a training plan training consisted of a practical exercise in developing OPORD paragraphs 2 and 3, an operations overlay, and an execution matrix for planning a JANUS simulation exercise. Developing the JANUS simulation exercise training consisted of a practical exercise in constructing training evaluation measures of success using tasks and standards from the Mission Training Plan (ARTEP 71-1-MTP), building a scenario, running a company-level JANUS simulation on the workstations, and providing proficiency ratings for the hypothetical company-trained tasks. Some of you received conventional paper and pencil practical exercises and some of you received training on an automated planning system with a laptop computer and performed your practical exercise using the laptop computer.

	YES	NO	N/A	COMMENTS
Did you participate in the training? (If not, check NO and skip to **PART III.**)				
Were the training objectives (tasks, conditions, and standards) clear?				
Were the explanations of new concepts, technology, and terms adequate for understanding the training planning process and the JANUS simulation?				
Could you see and hear the instruction, demonstrations, briefings, etc?				
Was training interrupted (i.e., equipment malfunctions, TDA taskings)?				
Was there enough time for completing the practical exercises?				
Do you think training time was used efficiently?				

	YES	NO	N/A	COMMENTS
Did you have a chance to practice hands-on with the laptop computer and the automated training plan program?				
Did you get to practice as much as you needed?				
Did the pace of training allow you to practice the demonstrated tasks?				
Were your mistakes identified and were you allowed to correct your performance?				
Were job aids provided?				
Were job aids accurate and helpful?				
Were training materials (technical manuals, handouts, etc.) available, necessary, easy to follow and use?				
Were questions answered satisfactorily?				
Did you feel you developed the necessary skills to develop a training plan and develop a JANUS exercise simulation?				
Was this training appropriate and useful to you? Please comment.				

PART III - COLLECTIVE TRAINING: This part of the questionnaire has two major sections that ask detailed questions about possible collective training experiences you may have participated in from January to August 1995. The collective training is divided into internal training events conducted by TF 2-33 assets and external training events that were evaluated by observer/controllers (EXFAC) personnel. The training opportunities are listed with brief descriptions to jog your memory about a particular event. Listed within each training opportunity is a set of questions pertaining to training factors important for describing the training for that event. Please answer the questions within each event by checking the response categories and making written comments when appropriate.

Section A. Internal Training. During your training preparation in Focused Dispatch there were at least three collective training events or exercises that TF 2-33 conducted. The exercises are listed with brief descriptions. For each exercise listed is a set of questions pertaining to training factors considered important for describing the training during that event. Please answer the questions listed under each exercise by checking and making written comments when appropriate. N/A = Not Applicable.

1. Battalion Slice Field Training Exercise (FTX) with Learning Center TOC (24-28 Apr)
This training exercise consisting of a Defense in Sector mission was conducted at Fort Knox Training Areas 8, 9, and 10. A Bn TOC was located at the TF 2-33 Learning Center with a digital equipment (IFSAS, ASAS, IVIS, and B2C2 digital) and FM capability layout similar to the C2V setup. BLUFOR in the field was B Company and OPFOR was portrayed by D Troop for force-on-force maneuver with MILES gear. Battalion slice digital elements played were the simulated C2V TOC and B Company with HHC field trains and artillery (FED).

	YES	NO	N/A	COMMENTS
Did you participate in the training? (If you check NO, skip to **2.**)				
Did you train as a member of a digitally-linked team? (If YES, please tell job duty and type of equipment in COMMENTS.)				
Were you proficient in conventional tasks and doctrine before training with this event?				
Were the training objectives (mission, tasks, conditions and performance standards) clear?				
Did you receive adequate hands-on practice with the equipment prior to start of this training event?				

	YES	NO	N/A	COMMENTS
Was training interrupted, i.e., equipment problems, delays due to weather, delays due to missing equipment, visitors?				
Did equipment deficiencies hinder your performance?				
Did software deficiencies hinder your performance, I.e., digital map terrain and actual terrain mismatch?				
Did training conform to doctrine where appropriate?				
Were written materials (technical manuals, doctrinal references, handouts, etc.) available?				
Did TF 2-33 personnel serve as evaluators for this event? If not, please identify evaluators in COMMENTS.				
Did the evaluator(s) provide valid and credible observations?				
Was feedback focused on training objectives, meeting standards, and linked to the mission and essential mission tasks?				
Were lessons learned identified and helpful in sustaining and improving performance?				

2. Battalion Slice Communication Exercise (4 May) This digital communication training exercise used the same Defense in Sector mission scenario (from the Bn Slice FTX the week before) and was conducted in the Learning Center and Motor Pool. The Learning Center TOC used mainly IVIS and B2C2 with ASAS as background support, the S1 and S4 were on B2C2 as a mock CTCP, the four company commanders and B Company 1st Sgt were located at the Motor Pool; the company commanders were using M1A2 tanks with IVIS and the B Company 1st Sgt had one B2C2. The HHC commander also had a B2C2 at a remote location.

	YES	NO	N/A	COMMENTS
Did you participate in the training? (If you check NO, skip to **3.**)				
Did you train as a member of a digitally-linked team? (If YES, please tell job duty and type of equipment in COMMENTS.)				
Were you proficient in conventional tasks and doctrine before training with digital equipment in this event?				
Were the training objectives (mission, tasks, conditions and performance standards) clear?				
Did you receive orientation training on limitations and capabilities of the digital equipment and/or software prior to starting the training event?				
Did you receive adequate hands-on practice with the equipment prior to start of this training event?				
Was training interrupted, i.e., equipment breakdowns, delays due to weather, delays due to missing equipment?				

	YES	NO	N/A	COMMENTS
Did digital equipment deficiencies hinder your performance?				
Did software deficiencies hinder your performance, I.e., digital map terrain and actual terrain mismatch?				
Did training conform to doctrine where appropriate?				
Were written materials (technical manuals, doctrinal references, handouts, etc.) available?				
Did TF 2-33 personnel serve as evaluators for this event? Please identify evaluators in COMMENTS.				
Did the evaluator(s) provide valid and credible observations?				
Was feedback focused on training objectives, meeting standards, and linked to the mission and essential mission tasks?				
Were lessons learned identified and helpful in sustaining and improving performance?				

3. Battalion FTX with C2Vs, BCV, and Paladin (13-16 Jun) This training exercise consisting of Defense in Sector and Movement to Contact missions was conducted at Fort Knox Training Areas 8, 9, and 10. A Bn TOC and CTCP were located in C2Vs, S3 in a BCV, and a Paladin for artillery support. A brigade cell with IVIS and B2C2 were used to simulate higher HQ for scenario play. BLUFOR in the field were C2Vs, BCV, Paladin, and B Company M1A2s with OPFOR portrayed by D Troop in mock-ups for force-on-force maneuver with MILES gear. A tactical road march was conducted to and from the field with usual plan /prep/execute phases for missions conducted in the field.

	YES	NO	N/A	COMMENTS
Did you participate in the training? (If you check NO, skip to **Section B.**)				
Did you train as a member of a digitally-linked team? (If YES, please tell job duty and type of equipment in COMMENTS.)				
Were you proficient in conventional tasks and doctrine before training with digital equipment in this event?				
Were the training objectives (mission, tasks, conditions and performance standards) clear?				
Did you receive orientation training on limitations and capabilities of the vehicles, digital equipment, and/or software prior to starting the training event?				
Did you receive adequate hands-on practice with the vehicles and digital equipment prior to start of the training event?				
Was training interrupted, i.e., equipment or vehicle breakdowns, delays due to weather, delays due to missing equipment)?				

	YES	NO	N/A	COMMENTS
Did equipment deficiencies hinder your performance?				
Did software deficiencies hinder your performance, I.e., digital map terrain and actual terrain mismatch?				
Did training conform to doctrine where appropriate?				
Were written materials (technical manuals, doctrinal references, handouts, etc.) available?				
Did TF 2-33 personnel serve as evaluators for this event? Please identify evaluators in COMMENTS.				
Did the evaluator(s) provide valid and credible observations?				
Was feedback focused on training objectives, meeting standards, and linked to the mission and essential mission tasks?				
Were lessons learned identified and helpful in sustaining and improving performance?				

Section B. External Training. During your training preparation in Focused Dispatch there were at least four collective training events or exercises that were conducted in virtual and constructive simulation and evaluated by observer/controllers (EXFAC). The exercises are listed with brief descriptions. For each exercise listed is a set of questions pertaining to training factors considered important for describing the training during that event. Please answer the questions listed under each exercise by checking and making written comments when appropriate. N/A = Not Applicable.

1. JANUS I Command Post Exercise (Conventional) (15-17 Feb) This constructive simulation CPX was conducted in the JANUS/BBS facility in Skidgell Hall. No digital equipment was used; simulated FM voice communications were played on CB radios. Simulation-based scenarios for two Movement to Contact missions and a Defense in Sector mission were conducted on an NTC database. The Bn TF was represented with four armor companies, Bn HHC, scouts, ADA, Engineers, FA, and mortars for support. Brigade was role played by JANUS staff members. The TOC had an S2/3 shop (with XO in charge), CSS, and FS shop located in Room 8 with maneuver units and Bde ops in Room 7. Personnel interacted with the simulation via operators controlling birds-eye views of the battlefield.

	YES	NO	N/A	COMMENTS
Did you participate in the training? (If you check NO, skip to **2.**)				
Were you proficient in conventional tasks and doctrine before training in this event?				
Were the training objectives (mission, tasks, conditions and performance standards) clear?				
Did you receive orientation training on limitations and capabilities of the simulation, workstations, and/or software prior to starting this training event?				
Did you receive adequate hands-on practice with the equipment and simulation prior to start of the training event?				
Was training interrupted, i.e., equipment, simulator, or simulation breakdowns?				

	YES	NO	N/A	COMMENTS
Did equipment and/or simulation deficiencies or realism hinder your performance?				
Did equipment layout/locations hinder your performance?				
Did training conform to doctrine where appropriate?				
Were written materials (technical manuals, doctrinal references, handouts, etc.) available?				
Was training effective and efficient?				
Did the evaluator(s) provide valid and credible observations?				
Was feedback focused on training objectives, meeting standards, and linked to the mission and essential mission tasks?				
Were lessons learned identified and helpful in sustaining and improving performance?				

2. Task Force SIMUTA Training Exercise (Conventional) (31-Mar-2 Apr) This virtual simulation training exercise was conducted in the SIMNET-T facility, the Mounted Warfighting Simulation Training Center (MWSTC). Simulation-based scenarios for Defense in Sector and Movement to Contact missions were conducted by the MWSTC staff and AARs were conducted by observer/controller staff (EXFAC). The TF had a Bn TOC, CTCP, HHC and UCMP field trains, Bn Aid Station, Mortar platoon, and four companies play in the exercise. Engineers, ADA, and FA assets were attached. FM voice communications were simulated with CBs; no digital equipment was used.

	YES	NO	N/A	COMMENTS
Did you participate in the training? (If you check NO, skip to **3.**)				
Were you proficient in conventional tasks and doctrine before training in this event?				
Were the training objectives (mission, tasks, conditions and performance standards) clear?				
Did you receive orientation training on limitations and capabilities of the simulation, workstations, simulators, and/or software prior to starting this training event?				
Did you receive adequate hands-on practice with the equipment and simulation prior to start of the training event?				
Did simulated equipment adequately replicate the real system hardware and software?				
Was training interrupted, i.e., equipment, simulator, or simulation breakdowns?				
Did equipment/simulation deficiencies or realism hinder your performance?				

	YES	NO	N/A	COMMENTS
Did equipment layout/locations hinder your performance, (i.e., BCV, TOC, CTCP, etc.) ?				
Did training conform to doctrine where appropriate?				
Were written materials (technical manuals, doctrinal references, handouts, etc.) available?				
Was training effective and efficient?				
Did the evaluator(s) provide valid and credible observations?				
Was feedback focused on training objectives, meeting standards, and linked to the mission and essential mission tasks?				
Were lessons learned identified and helpful in sustaining and improving performance?				

3. Virtual Simulation I (VS1) (4 - 21 Apr) This virtual simulation training/experiment event was conducted in the SIMNET-D facility, the Mounted Warfare Test Bed (MWTB). (First week was for training but whole event could be considered as training.) Simulation-based scenarios for Defense in Sector and Movement to Contact missions (on an NTC database) were conducted by MWTB staff and AARs were conducted by observer/controllers (EXFAC). The TF had a C2V shell mock-up for the TOC (with IFSAS(operator and FA officer), ASAS (with S2), B2C2 (hard-wired), and IVIS, a CTCP setup With B2C2, and alternate plans TOC with B2C2 (with NBC officer), Engineer, ADA, and FA assets attached to B company, scouts and the companies. The Bde operation was available with ASAS and B2C2.

	YES	NO	N/A	COMMENTS
Did you participate in the training? (If you check NO, skip to **4.**)				

	YES	NO	N/A	COMMENTS
Did you train as a member of a digitally-linked team? (If YES, please tell job duty and type of equipment in COMMENTS.)				
Were you proficient in conventional tasks and doctrine before training with digital equipment in this event?				
Were the training objectives (mission, tasks, conditions and performance standards) clear?				
Did you receive orientation training on limitations and capabilities of the simulation, simulators, workstations, and/or software prior to starting this training event?				
Did you receive adequate hands-on practice with the equipment, simulators, and simulation prior to start of the training event?				
Did simulated equipment adequately replicate the real system hardware and software, ex. IVIS?				
Was training interrupted, i.e., equipment, simulator, or simulation breakdowns?				
Did equipment/simulation deficiencies or realism hinder your performance?				
Did equipment layout/locations hinder your performance, (i.e., BCV, TOC, CTCP, etc.) ?				

	YES	NO	N/A	COMMENTS
Did training conform to doctrine where appropriate?				
Were written materials (technical manuals, doctrinal references, handouts, etc.) available?				
Was training effective and efficient?				
Did the evaluator(s) provide valid and credible observations?				
Was feedback focused on training objectives, meeting standards, and linked to the mission and essential mission tasks?				
Were lessons learned identified and helpful in sustaining and improving performance?				

4. JANUS III (22 May - 1 Jun) This constructive simulation exercise/experiment was conducted in the JANUS/BBS facility in Skidgell Hall. Digital equipment present was ASAS and B2C2 with IVIS-like emulation provided on workstations; simulated FM voice communications were played on CB radios. Simulation-based scenarios for Deliberate Attack, Movement to Contact, and Defense in Sector missions were conducted on the Western Kentucky Training Area (WKTA) database. ASAS and IVIS emulation digital equipment had the WKTA database with B2C2 still using the NTC database(which limited its function to text message traffic only). The Bn TF was represented with four company commanders (with tethered companies), Bn HHC, scouts, ADA, Engineers, FA, and mortars were support. Brigade was role played by JANUS staff members. The TOC had an S2/3 shop (with XO in charge), CSS, and FS shop located in Room 8 with maneuver units and Bde ops in Room 7. Personnel interacted with the simulation via operators controlling birds-eye views of the battlefield.

	YES	NO	N/A	COMMENTS
Did you participate in the training? (If you check NO, skip to **General Comments.**)				

	YES	NO	N/A	COMMENTS
Did you train as a member of a digitally-linked team? (If YES, please tell job duty and type of equipment in COMMENTS.)				
Were you proficient in conventional tasks and doctrine before training with digital equipment in this event?				
Were the training objectives (mission, tasks, conditions and performance standards) clear?				
Did you receive orientation training on limitations and capabilities of the simulation, simulators, workstations, and/or software prior to starting this training event?				
Did you receive adequate hands-on practice with the equipment, simulators, and simulation prior to start of the training event?				
Did simulated equipment adequately replicate the real system hardware and software, ex. IVIS?				
Was training interrupted, i.e., equipment, simulator, or simulation breakdowns?				
Did equipment/simulation deficiencies or realism hinder your performance?				
Did equipment layout/locations hinder your performance, (i.e., BCV, TOC, CTCP, etc.) ?				

	YES	NO	N/A	COMMENTS
Did training conform to doctrine where appropriate?				
Were written materials (technical manuals, doctrinal references, handouts, etc.) available?				
Was training effective and efficient?				
Did the evaluator(s) provide valid and credible observations?				
Was feedback focused on training objectives, meeting standards, and linked to the mission and essential mission tasks?				
Were lessons learned identified and helpful in sustaining and improving performance?				

General Comments: _____

_____

_____

_____

_____

TF 2-33 INTERVIEW QUESTIONS

1. What training did you do after the last battalion event but prior to starting the Live/Virtual experiment? (Comment on any problems.)
    a. Individual
    b. Group (include Combined Arms and BOS integration)
    c. Battalion level

2. What types of skills do you think a soldier should have prior to arriving for training in a digitized battalion?
    a. Where and how do you think skills should be trained?
    b. What level of skill proficiency is needed?

3. If you were in a digitized battalion task force, in what areas would focus your sustainment training:
    a. individual skill training
    b. small group/team/staff training
    c. combat fundamentals
    d. digital skill training
    e. information management
    f. cross-training
    g. BOS integration
    h. Combined Arms
    i. Live (field), Virtual (SIMNET), Constructive (JANUS), and Live/Virtual
    j. Internal AARs
    k. External AARs

4. Were there any specific training methods/technology that were or may be particularly effective/ineffective for training? Consider:
    a. computer and paper-based tutorials
    b. classroom training (lectures, hands-on demonstrations, practical exercises)
    c. learning center
    d. simulations
    e. field exercises

5. Considering how and what you were trained during Focused Dispatch, were there any knowledge and skills you felt would have improved your performance? Consider:
    a. individual performance
    b. small group, team, and staff performance
    c. battalion-level performance

6. Considering how and what you were trained during Focused Dispatch, were there any particular training exercises (COMMEX, CPX, FTX, STX, FCX, LOGEX), lane training, etc. that would be recommended to improve performance?

7. What types of training distractors did you encounter in :
    a. individual digital training
    b. small unit, team, and staff training
    c. Collective training in garrison/field, virtual simulation centers, and constructive simulation (JANUS)
    d. Live/virtual training

8. Were there any shortcomings or missing documentation that would have been helpful in assisting training in Focused Dispatch? If so, please describe.

9. Summarize any lessons learned about:
   a. individual skill training
   b. small group/team/staff training
   c. combat fundamentals
   d. digital skill training
   e. information management
   f. conceptual learning, i.e., entire system connections
   g. cross-training
   h. BOS integration
   i. Combined Arms
   j. Live (field), Virtual (SIMNET), Constructive (JANUS), and Live/Virtual
   k. internal AARs
   l. external AARs

10. Put yourself in charge of designing training for the 1st Cav at Fort Hood future and you have the opportunity to use different training methods(e.g., computer-assisted instruction, lectures, etc.) you've been exposed to .

   a. What types of training subject areas would you include, e.g., digital keyboarding, staff cross-training, etc.?

   b. What types of training delivery systems or methods would you use for training subject areas?

   c. How would you structure a progressive (crawl, walk, run, sustain) training program?

   d. What type of documentation (computer and/or paper-based) would be helpful for future digitization efforts?

Appendix C

Demographic Survey Results

BATTALION TASK FORCE
DEMOGRAPHIC SURVEY RESULTS

1. SC/MOS:
   12 SC12S ARMOR BR - 7 (12A-GENERAL), 2 (12B-ARMOR) , 2 (12C-CAVALRY)
   2 SC35D ALL SOURCE INTEL BR - M.I.
   1 SC91B TURRET/MAINTENANCE MANAGEMENT
   1 SC 67B LABORATORY SCIENCE - MEDICAL SERVICE CORP
   1 SC74A CHEMICAL GENERAL BR

2. Rank/Grade: 1 LTC, 2 MAJ, 7 CPT, 6 1LT, 1 2LT

3. Time in Military Service (Months):

All	N=17,	M=95.06	SD= 63.19	min =27	max= 237
Field Grade	n=3,	M=196.33	SD=44.99	min=148	max=237
CPT	n=7,	M=109.29	SD=25.94	min=82	max=147
LT	n=7,	M=37.43	SD=7.76	min=27	max=51

4. Time in Armor MOS/SC (Months):

All	N=12	M=98.42	SD=60.58	min=27	max=237
Field Grade	n=3	M=184.33	SD=46.69	min=148	max=237
CPT	n=6	M=87.00	SD=14.38	min=69	max=113
LT	n=3	M=35.33	SD=7.23	min=27	max=40

5. When did you report to TF 2-33: All (n=17) reported by Jan 95.

6. Circle your current TF 2-33 duty position:

Duty Position	n	Duty Position	n	Duty Position	n	Duty Position	n
Bn TF Cmdr	1	Bn S3	1	BICC	1	Mortar PL	1
Bn TF XO	1	Bn S3A	1	CO Cmdr	4	Med PL	1
Bn S1	1	Bn S4	1	HHC Cmdr	1		
Bn S2	1	CHEM Officer	1	Sct PL	1		

7. Prior to reporting to TF 2-33 *(or as of 1 Feb 95; start of the Focused Dispatch AWE training)*, how much experience did you have in the following TO&E (combat maneuver unit) positions? (Months):

n=16 (of 17)	M=51.44	SD=43.02	min=173	max=823

8a. How many times have you participated as a member of a rotating unit at NTC or CMTC?

n=11 (of 17)	M=3.36	SD=2.06	min=1	max=6

8b. What was your duty position(s) at NTC or CMTC? (Circle all that apply.)

n=11 (of 17); 6 had no NTC or CMTC experience.

	Plt Ldr	Spec Plt Ldr	Co XO	Co Cmdr	Bn XO	Bn S3A	Bn S1	Bn S4	Sqdn MO	DS Shop Officer	Bde S3A
1	X	X	X								
2				X				X			
3						X			X		
4	X	X	X								
5	X		X								
6	X	X									
7				X							
8										X	
9	X										
10	X	X	X				X				
11					X						X

9. As of 1 Feb 95, in which of the following SIMNET-D (MWTB) equipment evaluations have you participated? (Check all that apply.)

N=17 None = 9 One = 6 Three = 2

10. As of 1 Feb 95, how much SIMNET training experience did you have? (Circle one please.)

	n	Pct
0 hours	4	23.5
9-16 hours	1	5.9
17-24 hours	3	17.6
over 24 hours	9	52.9
Total	17	100.0

11. As of 1 Feb 95, how many JANUS training exercises had you participated in?

# JANUS Exercises	n
0	5
1	6
2	2
3+	4

12. As of 1 Feb 95, had you trained and/or had experience with any of the digital equipment you trained with or used in this experiment? Please list by type (i.e., B2C2, IVIS, ASAS), training received and/or experience, and dates.

6 of 17 responded with the rest responding "No", "N/A", or no response.

Comments (C):
C: B2C2 - trained by CSC contractor that developed it in 8-10 hours.
C: IVIS, B2C2
C: IVIS - PC Tutorial
C: ASAS - Attempted to slow the system for familiarization in OBC. Did not work on multiple attempts.
C: I had been exposed to B2C2 prior to deployment to 94-07. I had no formal training but I was familiar with what it was.
C: 94-07 - IVIS, B2C2

13a. As of 1 Feb 95, check your level of previous experience with computers. (Do not count SIMNET-T, SIMNET-D, or JANUS experience.)

Computer Experience	n	Pct
Limited experience	3	17.6
Moderate experience	13	76.5
Considerable experience	1	5.9
Total	17	100.0

13b. As of 1 Feb 95, if you related your experience with computers in terms of years, where would you place yourself on the chart below? (Circle a number please.)

Years of Computer Experience	n	Pct
Less than 1 year	2	11.8
More than 1 year	6	35.3
More than 3 years	3	17.6
5 years or more	6	35.3
Total	17	100.0

13c. Approximately how often did you use a computer each month prior to 1 Feb 95? (Circle a number please.)

Computer Use per Month	n	Pct
2-3 times a week	5	29.4
Daily	12	70.6
Total	17	100.0

13d. Approximately how often have you used a computer each month since reporting to TF 2-33 or after 1 Feb 95? Do not count time with the digital equipment (i.e., IVIS, ASAS, B2C2, etc.) used in training and the Focused Dispatch experiment. (Circle a number please.)

Computer Use per Month	n	Pct
Once a week	1	5.9
2-3 times a week	4	23.5
Daily	12	70.6
Total	17	100.0

13e. Prior to 1 Feb 95, had you used Windows (or a Windows-type software) while using a computer?

All had used Windows (N=17).

13f. People commonly report feeling uncomfortable using computers. Please circle below the value that best describes how you feel (in general) about using computers.

Level of Comfort with Computers	n	Pct
Neutral	2	11.8
Comfortable	10	58.8
Very comfortable	5	29.4
Total	17	100.0

14. Please check your highest civilian education level achieved:

Highest Education Level	n	Pct
College degree	13	76.5
Postgraduate work	4	23.5
Total	17	100.0

15. Please describe any additional factors (positive and negative) that may have affected your performance with the digital equipment used in Focused Dispatch training and/or the Live-Virtual experiment:

Positive Factors:

C: Had a good BASIC understanding for computers before started. Understood Conventional Ops before digital.
C: Training by the contractor that developed the B2C2 software.
C: M1A2 NETT, VSI-III, JanusIII, SIMNET (SIMUTA)
C: B2C2 being set up like Windows helped me out quite a bit. I felt comfortable with it.
C: Used computers extensively in college primarily--applications.
C: B2C2, which was the piece of equipment I used most often, runs on a Windows based system, which I have some experience using.
C: Had limited training on EPLRS at 94-07 and found it to be a very positive system. Had a good outlook on digital equipment.
C: The IVIS was quite simple to master. IVIS training need not take months; my crew mastered IVIS in two days during the Live-Virtual experiment.

C: Willingness to use the system and get on the system and experiment with what the system can do.
C: Prior BL experience. 94-07 information solid training strategy. Hands on equip to be used in AWE. Janus, SIMNET training. Warthog OK; was absolute winner.

Negative Factors:
C: Environmental factors such as heat/dust. Non-portability of the systems (i.e., fixed in a track and cannot remove).
C: VSI used only IVIS screen with no simulator. VS Live first time in M1A2 simulator.
C: Not very many "Help" features. System (MFCS) needs a more definitive user's guide (1 pager).
C: Did not receive B2C2 on a "permanent" basis until Jun 95.
C: I knew first-hand some of the negative comments and experiences TF 1-70 had at 94-07.
C: Changing versions of the software.
C: Limited field training with real equipment (too late in training cycle).

Appendix D

Primary Command and Control Systems Functional Descriptions

Brigade and Below Command and Control System

The B2C2, a prototype application SW of the Army Tactical Command and Control System (ATCCS), was designed to provide Cdrs and their staffs with tactical data for conducting C2 functions at the Bde and below level. The B2C2 SW versions during AWE FD ranged from version 3.4 upon initial introduction to the unit to version 3.6 used at WKTA. (Basically, log on/off procedures and SW commands became less cumbersome with some increased capability to interface with the IVIS with the introduction of each SW version.) The SW was designed to be hosted on an 80486 microprocessor and used a UNIX-based operating system. The B2C2 contained a video display capable of displaying maps from an installed terrain database with position location information using various symbols, graphics, and character text. A keyboard and trackball were used to enter user input. The B2C2 could be connected to a LAN or to combat radios (i.e., SINCGARS) via a Tactical Communications Interface Module (TCIM). Refer to the Brigade and Below Command and Control (B2C2) Computer System Operator's Software User's Manual (Draft) (U.S. Department of the Army, 1995b) for detailed information about B2C2 operations and functions.

The B2C2 capabilities included: (a) receiving and sending subordinate, peer, and higher echelon Cdr tactical combat and logistics message reports, OPORDs, and overlays; (b) receiving and sending free text messages to subordinates, peers, and higher echelon Cdrs; and (c) providing a means for communicating with TF Cdrs, staff, and CSS assets. It provided an asset to be used for collecting, manipulating and disseminating C2, tactical, and logistics information. The B2C2 was used to advise the TF Cdr of the current ground situation and monitor the Bde and Bn close battle. It also became a tool for tracking with the battle plan.

Intervehicular Information System

The IVIS provided the operator the capability for digital transmission of preformatted reports and map overlays between vehicles. The IVIS also has a limited free text capability. The IVIS system, developed as a Co-level tool, improves C2 capabilities by constantly exchanging and updating position navigation data with other friendly users which allows them to display friendly positions on the IVIS screen. It also provides unit Cdrs with a digital link with air and artillery units which can reduce response time for fire missions. Ammunition, fuel, maintenance, and other data is also maintained. During AWE FD, IVIS supported Bn-level communications. The IVIS was capable of exchanging five preformatted message reports (i.e., Contact, Spot, CFF, Situation, and Medical Evacuation reports) with the B2C2. (However, this was not done during TF operations because the IVIS had to be set to different baud rates and frequencies

which prevented the IVIS from receiving reports and overlays on assigned nets and frequencies.)

The IVIS is a prototype application SW developed by General Dynamics Land Systems division hosted on a UNIX-based operating system. A number of different IVIS emulator HW configurations were used during AWE FD. The M1A2 tank-mounted IVISs had small monochrome plasma displays, and used an alphanumeric keypad entry device to enter data into the system, with a thumb operated cursor controller mounted on the Cdr's Integrated Control Handle Assembly. The IVIS systems used in the C2Vs were referred to as the IGS, and had color computer monitor displays, and full sized keyboard data entry devices. Refer to the Operator's Manual, Operator Controls, PMCS, and Operation Under Usual Conditions, Tank, Combat, Full-Tracked: 120-MM Gun, M1A2 (U.S. Department of the Army, 1995f) for detailed information about IVIS operations.

The IVIS capabilities included: (a) receiving subordinate combat reports and overlays; (b) displaying current friendly or enemy situation overlays; (c) providing a means for communicating with subordinate Cdrs; (d) providing access to near real-time intelligence information; and (e) monitoring various radio nets. It provided an asset to be used for collecting, manipulating and disseminating tactical information. The IVIS was used to advise the TF Cdr of the current ground situation and monitor the Bn close battle. It, like the B2C2, became a tool for tracking the battle plan.

All Source Analysis System

The ASAS (known as Warrior), was UNIX-based Windows SW running on a Sun SPARC WS with a large color display and detached keyboard and mouse. The ASAS is a computer-assisted intelligence and electronic warfare (IEW) processing, analysis, reporting, and technical control system that provided automated intelligence and information management functions for the TF S2 personnel. The system has a large storage and retrieval capacity allowing it to use a number of databases ranging from electronic intelligence to imagery files (i.e., satellite or unmanned aerial vehicle (UAV) images) that can be accessed and displayed as annotated pictures. Although the ASAS Warrior WS can interface with most communication links (including SINCGARS) and transmit and receive various communication files with its communication package, it could not interface with any of the other digital systems used by the TF, i.e., IVIS, B2C2, and IFSAS. The lack of interface required information or data (i.e., coordinates) to be "swivel-chaired" (manually inputted) into the other primary C2 digital systems. The system could be set up in stand-alone mode or as a LAN with other ASAS Warrior WS (Norris and Reese, 1993).

The ASAS capabilities included: (a) historically tracking enemy units and displaying near real time enemy situations; (b) providing target identification and nomination; (c) performing line of sight (LOS) and intervisibility functions for terrain analysis; (d) performing numerical and distance calculations; (e) managing intelligence collection; (f) processing and reporting intelligence information; (g) receiving operations reports; and (h) providing a free text message capability (Norris and Reese, 1993; Jensen, 1995). The Bn S2 and BICC used ASAS to (a) communicate with each other and Bde, (b) advise the Cdr and update the XO on the enemy situation, (c) direct intelligence collection efforts, and (e) monitor the enemy situation for the TF.

Initial Fire Support Analysis System

The IFSAS is an interim field artillery C2 system leading to the Advanced Field Artillery Tactical Data System (AFATDS) that is currently being fielded to units, i.e., first unit equipped in August, 1995. It is based on SW used in the Lightweight Tactical Fire Direction System (LTACFIRE) by light forces. The IFSAS consists of SW housed in LCUs digitally linked with computers and other remote devices that interoperate with existing radio and wire communication equipment. Although designed to increase fire support efficiency (through speed and accuracy) for maneuver forces, it does not interfere with command relationships, doctrine, or tactics governing the use of fire support under normal conditions. The IFSAS included capabilities to process and disseminate (a) conventional fire plans, (b) artillery target information, (c) fire missions generated from incoming intelligence requests, (d) fire support coordination measures and battlefield geometry, (e) ammunition and fire data, (f) message of interest of selected data to other facilities, and (g) meteorological and survey data. The IFSAS could interface with the FSE within a unit, i.e., the TF Cdr's BCV (U.S. Department of the Army, 1993).

The IFSAS was used to disseminate the Cdr's targeting priorities and provide information to advise the Cdr on fire support matters and current ground situation. A primary function was to automate tactical fire direction functions for the TF by providing responsive Call for Fire (CFF) planning and execution capabilities. The IVIS was the only other primary C2 system that linked to IFSAS. Inter-communication of IVIS and IFSAS was limited to processing CFF information from TF fire mission requests. The IFSAS did communicate with Bde and peer fire support systems located with the Cdr's BCV, Mortar Plt, and the Co FIST.

Appendix E

Selected Training Questionnaire Results

BATTALION TASK FORCE TRAINING QUESTIONNAIRE

PART II - INDIVIDUAL/STAFF TRAINING:

Section A. New Equipment Training				
	YES	NO	N/A or MISSING	COMMENTS
Did you participate in the training? (If you did not attend this class, check NO and skip to **Section B.**)	1	15	1	
Were the training objectives (tasks, conditions, and standards) clear?	1			
Were you made aware of the training schedule?	1			
Were enough trainers present to provide adequate assistance?	1			
Did you receive explanations of any new concepts, technology, and terms?	1			
Did you have individual access to training equipment (or actual equipment) during training?	1			
Was the equipment readily available when needed?	1			
Did the equipment work properly?	1			
Could you see and hear the instruction, demonstrations, briefings, etc?	1			

	YES	NO	N/A or MISSING	COMMENTS
Was training interrupted (i.e., equipment breakdowns, delays due to weather, delays due to missing equipment, training aid malfunctions)?		1		
Was there enough time during training sessions?	1			
Was need-to-know information emphasized; nice-to-know minimized?	1			
Did training progress from simple to more difficult tasks?	1			
Were demonstrations of task performance provided?	1			
Were you allowed to individually practice hands-on with the equipment?	1			
Did you get to practice as much as you needed?	1			
Were you told what you were doing right or wrong during practice?	1			
Was feedback provided as soon as possible after practice?	1			
Were job aids given at the beginning of training?	1			
Were job aids accurate and helpful?	1			
Were training materials (technical manuals, workbooks, handouts, etc.) available, necessary, easy to follow and use?	1			
Were questions answered satisfactorily?	1			NETT personnel were very professional.

	YES	NO	N/A or MISSING	COMMENTS
Were you tested after training?	1			
Were test instructions and standards for pass/fail clear?	1			
Were you told what you did right or wrong on the tests?	1			
Were you given opportunities to go through remedial training?	1			

Section B. Tutorials:

1. Laptop computer IVIS (version 1.9) *emulation software* for use with the Automated Tactical Reports *programmed text*.				
	YES	NO	N/A or MISSING	COMMENTS
Did you train by using the Laptop Computer IVIS emulation software? (If you did not use, check NO and skip to **Question 2.**)	16	1		-Laptop IVIS is not exactly like the IVIS on the M1A2/M2A2s.
Were the training objectives (tasks, conditions, and standards) clear?	14	1	1	-manuals not written for IVIS emulator.
Were explanations of any new concepts, technology, and terms clear?	9	4	1	-more details to what each is used for makes it clear what you will do with it. -routing matrix unclear.
Did you have adequate access to a computer when you wanted to use this software for training?	16			-loaded on my office computer. -loaded on my office computer.

	YES	NO	N/A or MISSING	COMMENTS
Any equipment/software problems that limited the effectiveness of your training?	9	7		-IVIS would lock up and crash w/this laptop tutorial. -the software was not crash proof, nor was it the same I would see later. -the software could have emulated the IVIS more closely. -the IVIS emulator was not very robust and had glitches that caused systems lock-up. -the software did not fully match the reference material. -fewer reports than in objective system. -prewritten tactical scenarios would help. -didn't have same capability as actual software. -ability to relay reports.
Did this IVIS emulation software ever confuse you because the real IVIS looked or responded differently than the emulation software?	10	6		-never received training on the real IVIS. -differences between the emulator & real. -yes; particularly with logon procedures. -initially yes, but it did give you a base start as opposed to nothing. -didn't have same capability as actual software. -emulation harder to operate. If you understand the emulator you are that much better w/the real system.

	YES	NO	N/A or MISSING	COMMENTS
Compared to other methods of IVIS training, was the IVIS software with lessons in programmed text good training?	13	3	1	-There was some confusion caused by software differences. -I really didn't learn anything I couldn't have learned on my own. -limited ability to do things on a laptop. -good concept, but we received the emulation software with no train-up/explanation. -it was a basic get started program.
Was the addition of programmed text for guiding the IVIS software training a better approach than simply exploring the IVIS reporting functions on your own?	13	3		-I like to experiment with programs by pushing all the buttons to see what it can do. -added structure, objectives. -I personally found myself & soldiers going through the computer not the text. Maybe a help function in the program would be better. -absolutely--still requires event training modules.
Do you think this training was efficient compared to other IVIS training?	13	1	2	-different from use with ICAT. -hands-on is a must. -strictly for base line knowledge -but very limited.
Did you get to practice as much as you needed?	16			
Was training feedback sufficient?	7	8	1	-as it was all individual, there was no feedback.
Was the programmed text easy to follow and use?	13	3		-the text often had nothing to do with the software.
Do you think the Army should invest in this type of training technology (laptop computers with software) for digital training?	14	1	1	-depends on if a viable emulator can be developed. -you will get more from the IVIS ICAT. -definitely. -yes but recommend instructional software be embedded in objective system. -yes, but be more deliberate in fielding it. Don't just throw it at us. -would be nice for ASAS. -for all digital applications--enables you to learn/retain/sustain throughout the training period.

2. Automated Overlay Techniques and Digital Message Routing Matrix *programmed text.*				
	YES	NO	N/A or MISSING	COMMENTS
Did you train using this programmed text? (If you did not use, check NO and skip to **Question 3.**)	13	4		
Were the training objectives (tasks, conditions, and standards) clear?	12	1		
Were explanations of any new concepts, technology, and terms clear?	12	1		
Compared to other methods of IVIS training, was training with programmed text good training?	11	1	1	-no tutorial. -good for group level introductory tng. -hands on and a system that really works would be better. Overlays wouldn't be same so never felt confident about system.
Do you think this training was efficient compared to other IVIS training?	9	2	2	-not routing matrix.
Was training feedback sufficient?	6	5	2	-no feedback, all individual training. -initial tng should have NET instructors.
Was the programmed text easy to follow and use?	12	1		
Do you think the Army should invest in stand-alone programmed text for digital training?	12	1		

3. IVIS Intelligent Computer Aided Trainer (ICAT) *courseware* on workstations in the TF 2-33 Learning Center.				
	YES	NO	N/A or MISSING	COMMENTS
Did you train using the IVIS CAT courseware located in the TF 2-33 Learning Center? (If you did not use, check NO and skip to **Question 4.**)	9	8		-there were some software differences on this program as well which caused confusion when we used the real IVIS on the M1A2/M2A2s.
Were the training objectives (tasks, conditions, and standards) clear?	9			
Were explanations of any new concepts, technology, and terms clear?	8		1	
Did you have adequate access to the Learning Center workstation and ICAT courseware when you wanted to train?	9			-rotating basis like UCOFT for the staff.
Any equipment/software problems that limited the effectiveness of your training?	2	7		-it was much more realistic than the laptop tutorial.
Did this IVIS ICAT emulation software ever confuse you because the real IVIS looked or responded differently than the emulation software?	7	2		-never trained on the real IVIS. -sending overlays. -this was a good step over the other IVIS training until we had real IVIS. -only on limited items. Overall good tool.
Compared to other methods of IVIS training, was the IVIS ICAT courseware good training?	8		1	
Was the interactive computer assisted instruction approach better than simply exploring the IVIS functions on your own?	9			-absolutely.
Do you think this training was efficient compared to other IVIS training?	9			

	YES	NO	N/A or MISSING	COMMENTS
Did you get to practice as much as you needed?	9			
Was training feedback sufficient?	6	3		-system needs a way to keep track of progress made by students.
Was the program easy to follow and use?	7	1	1	-handouts for setup are a must.
Do you think the Army should invest in this type of training technology (interactive courseware) for digital training?	9			-this could be the stand alone trainer vs. the laptop trainer. -rework evaluation and program text.

4. Using the scale below, write the number beside each tutorial method indicating how much you think you learned compared with using the real equipment? Rate each tutorial by placing a number by the tutorial method. Write "N/A" in blanks beside the tutorial(s) you did not use.

a. IVIS emulation software with programmed text

Rating	n
Learned much more	2
Learned more	5
Learned about the same	3
Learned less	2
Learned much less	2
N/A	2

b. Programmed text only

Rating	n
Learned more	1
Learned about the same	2
Learned less	5
Learned much less	5
N/A	4

c. ICAT courseware

Rating	n
Learned much more	2
Learned more	6
Learned much less	2
N/A	6
Missing	1

Comment:
- There is nothing like the real thing. I felt like I relearned the entire system in WKTA. It is an easy system to learn given 1-2 hours of watching another user.
- IVIS ICAT the best initial training.
- I believe the best training is getting on the actual equipment and seeing what it can do. Most program software work how the actual system should work, not as it really works.
- Must have a program.

5. In general, were self-paced tutorials effective in training you to operate the digital equipment?

Rating	n
YES	14
NO	1
N/A	1
Missing	1

Comment:
- They could be done/redone as the user needed to at home or work.
- This is a good training concept because soldiers enter the Army with very different levels of education and intelligence.
- These systems can be very effective. Some drawbacks are the slowness of advancement for more computer literate people (too easy), software glitches, lack of group training for feedback.
- That's the only one I used.
- On off time it gave myself and the S2 section chance to explore/understand IVIS and the capabilities provided to the maneuver units.
- Self paced instruction still requires supervision.
- Yes, for "switchology" not for tactical use.
- Each person has a different level of computer knowledge. This allows people to move at their own pace.
- Self paced training is like a correspondence course. Self paced training needs to be driven by the chain of command. Emphasis is on training and sustaining with a log to track performance at Co or Bn level.
- Gives you a work through for each level. Answers the user's questions. Easy to use. Still require a series of vignettes/gates to work through based on user position crewman PSG PLDR etc.

Section C. Classroom Training

1. Digital Tactics, Techniques, and Procedures (TTP) Overview Class (2 Feb)				
	YES	NO	N/A or MISSING	COMMENTS
Did you participate in the training? (If you did not attend the classes, check NO and skip to **Question 2.**)	13	4		-briefing info was good for about 1 hour of trng on IVIS laptop, then you become more knowledgeable than the briefing.
Were the training objectives clear?	10	3		-the briefing could have been focused at the large picture.

	YES	NO	N/A or MISSING	COMMENTS
Do you think the overview information about IVIS operations, nets, and TTPs helped prepare you for digital operations?	8	5		-1st introduction to IVIS. -gave us a very broad overview of capabilities of IVIS, mixed with some very specific info of dubious value. -first (include all systems) and work your way down dealing with the concept. Actual IVIS info could have been covered in IVIS ICAT 1st block of trng. -good intro start point.
Were the explanations of new concepts, technology, and terms adequate for understanding digital operations?	10	3		-it made me more familiar, however, I still did not understand fully digital operations.
Could you see and hear the instruction, briefings, videotape presentations, etc?	13			
Do you think training time was used efficiently?	9	4		
Was need-to-know information emphasized; nice-to-know minimized?	7	5	1	-the routing matrix is worthless for the ALOC, a fact I didn't realize or come to grips with until the last day of the experiment. -got a mix of both, with no real identification which was which. -good entry level presentations.
Was the shirt pocket IVIS Reference Guide (routing matrix) accurate and helpful in later use?	8	1	4	-never got it. -didn't receive one. -primarily used B2C2. -but, did not enlighten us to the power of this product and how to use it when, where, and why.
Were training materials (Special texts, workbooks, tutorial software, handouts, etc.) available, necessary, easy to follow and use?	5	6	2	-50/50 now we need to fix it.
Were questions answered satisfactorily?	10	2	1	

2. B2C2 Operator Training Class (22-23 Feb)				
	YES	NO	N/A or MISSING	COMMENTS
Did you participate in the training? (If you did not attend this class, check NO and skip to **Question 3.**)	10	7		
Were the training objectives clear?	9	1		
Were enough trainers present to provide adequate assistance?	3	7		-not everyone had hands on training. -needed more informed "helpers." -this slowed down the training. Probably needed 1 trainer per system. -people had to share systems. -poor student-teacher ratio.
Did the B2C2 class give you the basic skills needed to continue learning about the system on your own?	8	2		-not enough hands on.
Were the explanations of new concepts, technology, and terms adequate for understanding digital operations?	8	2		-most of the class dealt with how to run program. No time given to tactical application.
Did you have hands-on access to B2C2 equipment during the training?	8	2		-too few LCUs.
Did the equipment function properly?	4	5	1	-it crashed many times. -it went down several times. -s/w crashed on all systems at least once (prototype s/w). -numerous crashes. -crashed too many times and got the "If this worked you could do this" statement.
Could you see and hear the instruction, demonstrations, briefings, etc?	9	1		-too few LCUs.
Was training interrupted (i.e., equipment breakdowns, training aid malfunctions, etc.)?	9	1		-only when s/w crashed or hard drive crashed. -crashes.

	YES	NO	N/A or MISSING	COMMENTS
Was there enough time during training sessions?	8	2		-for computer literates, the time was sufficient. For others, it was rushed. -for this type of structured class, need more hands on. -because of shortage of instructors and systems.
Were training sessions and breaks adequate to keep you from becoming bored or fatigued?	8	2		-could have sped up process if instructor knew best applications for system.
Do you think training time was used efficiently?	5	5		-yes & no for a brief overview, need more hands on with the experts to walk us through. -too few LCUs.
Was need-to-know information emphasized; nice-to-know minimized?	7	3		-the start up and OPFAC creation are the most important problems we faced later.
Did training progress from simple to more difficult tasks?	7	2	1	-OPFAC being the most difficult has to be near the front. -was done sequential not easy tasks to hard tasks.
Did the pace of training allow you to practice the demonstrated tasks?	4	6		-somewhat. LCUs were few, students were many. Not enough individual time. -went too fast you found yourself just punching numbers to keep up without really understanding. -could have used more time to allow all to keep up. -too few LCUs.
Were you allowed to individually practice hands-on with the equipment?	9	1		-minimally. -doesn't help if you're not taught basics. -too few LCUs.
Did you get to practice as much as you needed?	4	6		-in the learning center. -needed more time and more systems. -crashes.
Were you told what you were doing right or wrong during practice?	6	4		-not enough instructors.

	YES	NO	N/A or MISSING	COMMENTS
Were your mistakes identified and were you allowed to correct your performance?	5	4	1	-not always. -at times they were fixed so quickly you didn't understand how they were fixed. -not enough time.
Were job aids given at the beginning of training?	7	3		-none other than the manual which we did not really use.
Were job aids accurate and helpful?	6	2	2	
Were training materials (technical and users manuals and handouts) available, necessary, easy to follow and use?	5	5		-TMs and manuals for B2C2 are intimidating and not easy to understand and/or use. TFXXI will need many computer smart operators, not just SIGO. Operators are the key. -none were given.
Were questions answered satisfactorily?	9	1		
Were you given opportunities to go through remedial training?	1	7	2	-no date was given for additional training.
Given what you know now about digital operations, was there information missing that would have been useful to you during your follow-on training?	8	2		-upgrading never happened until later. -OPFACs: this is a class in and of itself. -not enough time to cover everything you need to know about crash recovery. OPFAC configuration, and message routing/network config. Smart operators are imperative. -more LCUs! -system hands on focused training.

3. Did you attend classroom sessions other than the ones listed here? (Circle one.)

Rating	n
YES	3
NO	13
Missing	1

If Yes, please list, give approximate dates, and short description of subjects/lessons:

- Telementoring: 27-31 Mar, 26-30 Jun, 25-27 Jul; classroom training in March and June focused on teaching the advanced medical skills that Telementoring requires. Training in July was in a field environment and incorporated the use of the radio link between the medic and the PA.
- Same classes taught w/new version of B2C2 software during Live/Virtual Experiment. 5 hours Sat. 12 Aug 95.
- Feb 12-16, 1995--ASAS user's training at Ft. Huachuca, AZ. Basic operations & functions focused on DIV & higher level use not on BDE/BN.

4. In general, were classroom sessions effective in training you in digital operations? (Circle one.)

Rating	n
YES	9
NO	4
N/A	2
Missing	2

Comment:
- Both. Some helped, but others left me unprepared.
- To give you the basics--hands on is required to learn to operate the system the classroom is not the most conducive.
- Most tng came from hands on experience during experiments.
- Not as effective as hands on tutorials.
- Very limited
- Not for what I now know. Needs to be hands on oriented at the level you will use the system at.
- IVIS classroom tng was a waste of time. Should have been conducted like the B2C2 tng.

Section D. IVIS Hands-On Training (7-9 Feb)				
	YES	NO	N/A or MISSING	COMMENTS
Did you participate in the training? (If you did not attend this class, check NO and skip to **Section E.**)	1	15	1	
Were the training objectives (tasks, conditions, and standards) clear?	1			

	YES	NO	N/A or MISSING	COMMENTS
Did you have individual access to training equipment (or actual equipment) during training?	1			
Could you see and hear the instruction?	1			
Was training interrupted (i.e., equipment malfunctions)?	1			
Was there enough time during training sessions?	1			
Do you think training time was used efficiently?	1			
Was need-to-know information emphasized; nice-to-know minimized?	1			
Did training progress from simple to more difficult tasks?	1			
Were you allowed to individually practice hands-on with the equipment?	1			
Did you get to practice as much as you needed?	1			
Were you told what you were doing right or wrong during practice?	1			
Were job aids provided?	1			
Were job aids accurate and helpful?	1			
Did you have to create your own job aid materials (i.e., cheat sheets, procedure notes, etc.)?	1			

	YES	NO	N/A or MISSING	COMMENTS
Were training materials (technical manuals, handouts, etc.) available, necessary, easy to follow and use?	1			- there is a whole series of GTAs that need to be developed for the M1A2 Boresighting, Plum and Synchronization, POSNAV verification, sincgars setup operation for M1A2/M2A2, Miles installation/ Boresighting, etc.
Were questions answered satisfactorily?	1			
Were you tested after training?	1			
Were test instructions and standards for pass/fail clear?	1			
Were you told what you did right or wrong on the tests?	1			
Were you given opportunities to go through remedial training?	1			
Was training and testing safely conducted?	1			
Did you feel you developed the necessary skills to operate the system?	1			

Section E. SATS-TREDS and JANUS Simulation Practical Exercise Training (8 - 12 May				
	YES	NO	N/A or MISSING	COMMENTS
Did you participate in the training? (If not, check NO and skip to **PART III.**)	13	3	1	
Were the training objectives (tasks, conditions, and standards) clear?	9	4		-I never really understood why we were doing it. I just followed directions and completed it. -the objective of this exercise was unclear from the start. -we had no idea what we going to do before we showed up!

	YES	NO	N/A or MISSING	COMMENTS
Were the explanations of new concepts, technology, and terms adequate for understanding the training planning process and the JANUS simulation?	10	3		-Janus never "came up" (it was broken).
Could you see and hear the instruction, demonstrations, briefings, etc?	13			
Was training interrupted (i.e., equipment malfunctions, TDA taskings)?	4	9		-my job kept me out of some of the training. -equipment worked good. -Janus malfunction.
Was there enough time for completing the practical exercises?	9	4		
Do you think training time was used efficiently?	7	6		
Did you have a chance to practice hands-on with the laptop computer and the automated training plan program?	9	4		- was in the conventional work group.
Did you get to practice as much as you needed?	5	8		
Did the pace of training allow you to practice the demonstrated tasks?	7	5	1	
Were your mistakes identified and were you allowed to correct your performance?	6	6	1	-job interference.
Were job aids provided?	9	3	1	
Were job aids accurate and helpful?	8	4	1	
Were training materials (technical manuals, handouts, etc.) available, necessary, easy to follow and use?	7	5	1	

	YES	NO	N/A or MISSING	COMMENTS
Were questions answered satisfactorily?	12		1	
Did you feel you developed the necessary skills to develop a training plan and develop a JANUS exercise simulation?	5	8		
Was this training appropriate and useful to you? Please comment.	5	7	1	-a much better MOI and instruction needs to be developed for this training to be really effective. -I was in the conventional workgroup and learned nothing about Janus. -my job kept me away so I don't feel I really got good training. -I think this program will be a great training tool. Contingency plan can be back with automated trainup. -I thought the exercise provided absolutely nothing constructive to Force XXI. -I was a manual player. It was good training concerning evaluation of training, but not necessarily good training plan work. -but it wasn't part of AWE. -training plan was useful. Janus at Company level is not. -would have been much more so had we known beforehand what we were going to do. -powerful tool for Co and Bn. Would welcome more indepth tng to fully use this technology. -while I could see the usefulness of such a program the software was not complete and very limited in its capabilities at the time.

PART III - COLLECTIVE TRAINING:

Section A. Internal Training.

1. Battalion Slice Field Training Exercise (FTX) with Learning Center TOC (24-28 Apr)				
	YES	NO	N/A or MISSING	COMMENTS
Did you participate in the training? (If you check NO, skip to **2.**)	12	5		
Did you train as a member of a digitally-linked team? (If YES, please tell job duty and type of equipment in COMMENTS.)	9	2	1	-OPFOR Commander. -S4 linked to BTM via B2C2. -mortar platoon. MFCS we could talk to (FED, IFSAS). -ASAS had no conductivity so I did not participate on a digital level. -S3 in BCV. -B2C2 in field trains CP. -BN S2 with ASAS. -chemo in Lrn Center.
Were you proficient in conventional tasks and doctrine before training with this event?	11		1	
Were the training objectives (mission, tasks, conditions and performance standards) clear?	10	1	1	
Did you receive adequate hands-on practice with the equipment prior to start of this training event?	8	2	2	-the first time actually using real equipment.
Was training interrupted, i.e., equipment problems, delays due to weather, delays due to missing equipment, visitors?	6	5	1	-FM link/Digital link. -equipment problems. -only occasionally.
Did equipment deficiencies hinder your performance?	6	5	1	-did not have Cdr, TF, C2V. No ASAS -no BDE S2 element played as part of our training. -range of B2C2. -that's how we developed work arounds, TTPs, & how tos.

	YES	NO	N/A or MISSING	COMMENTS
Did software deficiencies hinder your performance, I.e., digital map terrain and actual terrain mismatch?	7	3	2	-B2C2 still NTC terrain. -TCIM, of the MFCS was initially broken, but was fixed before the AWE. -no digital terrain on ASAS for planning purposes did create work around that taught us how to build a map. -no e-map for B2C2 & ASAS. -need digital map for any area a digital force plans to train. -no Ft. Knox terrain in B2C2 to help out.
Did training conform to doctrine where appropriate?	9	1	2	-PLT CO TF crawl walk run. Use of construction simulation live methodology.
Were written materials (technical manuals, doctrinal references, handouts, etc.) available?	8	3	1	-we were creating as we did it -doctrine conventional yes. digital no i.e., C2V, BCV, CSS opns.
Did TF 2-33 personnel serve as evaluators for this event? If not, please identify evaluators in COMMENTS.	8	1	3	-no real evaluation, internal AAR. -I don't know. -USAFAS provided SME spt. -yes. no warthog OCs in simulation construction tng.
Did the evaluator(s) provide valid and credible observations?	4	2	6	-not on the CSS. -no higher S2 to evaluate me. -really don't remember.
Was feedback focused on training objectives, meeting standards, and linked to the mission and essential mission tasks?	8	1	3	-focused on proving system would work than to the METL.
Were lessons learned identified and helpful in sustaining and improving performance?	11		1	-best training for TF at that time. Gave us confidence that systems worked.

2. Battalion Slice Communication Exercise (4 May)				
	YES	NO	N/A or MISSING	COMMENTS
Did you participate in the training? (If you check NO, skip to **3.**)	8	9		-on leave. -yes, but only as part of a digital COMEX. -ASAS link not establish to BDE.
Did you train as a member of a digitally-linked team? (If YES, please tell job duty and type of equipment in COMMENTS.)	6	1	1	-once again ASAS had no conductivity to proof TTPs. -S3. -C Co Commander.
Were you proficient in conventional tasks and doctrine before training with digital equipment in this event?	7		1	
Were the training objectives (mission, tasks, conditions and performance standards) clear?	5	2	1	
Did you receive orientation training on limitations and capabilities of the digital equipment and/or software prior to starting the training event?	5	2	1	
Did you receive adequate hands-on practice with the equipment prior to start of this training event?	5	2	1	
Was training interrupted, i.e., equipment breakdowns, delays due to weather, delays due to missing equipment?	3	4	1	
Did digital equipment deficiencies hinder your performance?	2	5	1	-no ASAS, no e-map for B2C2.
Did software deficiencies hinder your performance, I.e., digital map terrain and actual terrain mismatch?	3	3	2	-ASAS still had no Ft. Knox terrain. -no ASAS, no e-map for B2C2.

	YES	NO	N/A or MISSING	COMMENTS
Did training conform to doctrine where appropriate?	4	2	2	
Were written materials (technical manuals, doctrinal references, handouts, etc.) available?	6	1	1	
Did TF 2-33 personnel serve as evaluators for this event? Please identify evaluators in COMMENTS.	2	4	2	-Warthogs.
Did the evaluator(s) provide valid and credible observations?	3		5	
Was feedback focused on training objectives, meeting standards, and linked to the mission and essential mission tasks?	3		5	-to some extent.
Were lessons learned identified and helpful in sustaining and improving performance?	4		4	

3. Battalion FTX with C2Vs, BCV, and Paladin (13-16 Jun)				
	YES	NO	N/A or MISSING	COMMENTS
Did you participate in the training? (If you check NO, skip to **Section B.**)	14	2	1	

	YES	NO	N/A or MISSING	COMMENTS
Did you train as a member of a digitally-linked team? (If YES, please tell job duty and type of equipment in COMMENTS.)	11	2	1	-OPFOR Commander. -S4 B2C2 link with HHC and BTM. -mortar platoon leader MFCS. -as OPFOR Commander not directly as a digitized Asst S2. -C2V TF battle captain.. -S3 from BCV. -C Co Commander M1A2. -BN S2, BDE S2 didn't stay, no equipment available to have ASAS systems talk without a direct cable link. -chemo in C2V.
Were you proficient in conventional tasks and doctrine before training with digital equipment in this event?	13		1	
Were the training objectives (mission, tasks, conditions and performance standards) clear?	12	1	1	
Did you receive orientation training on limitations and capabilities of the vehicles, digital equipment, and/or software prior to starting the training event?	9	2	3	
Did you receive adequate hands-on practice with the vehicles and digital equipment prior to start of the training event?	8	3	3	-first time on C2V or mock up. TOC had C2V mock up for all other training but CTCP did not. -hands-on during the FTX. -did not have C2V tng at that time.
Was training interrupted, i.e., equipment or vehicle breakdowns, delays due to weather, delays due to missing equipment?	4	8	2	-but much less than in previous exercises. - ASAS system had a hard drive crash.
Did equipment deficiencies hinder your performance?	4	8	2	-no e-map for ASAS/B2C2. -again, much less than before. -with wireless LAN capability ASAS systems couldn't talk.

	YES	NO	N/A or MISSING	COMMENTS
Did software deficiencies hinder your performance, I.e., digital map terrain and actual terrain mismatch?	7	4	3	-B2C2 still NTC terrain. -did not have digital terrain on B2C2 or ASAS of Ft. Knox. -no e-map for ASAS/B2C2. -no digital terrain, no battle damage assessment. -need Ft. Knox digital terrain.
Did training conform to doctrine where appropriate?	12		2	
Were written materials (technical manuals, doctrinal references, handouts, etc.) available?	9	3	2	-I could have used a manual of the IFSAS when we were trying to figure out how to talk to the mortars. -most we made and used to confirm.
Did TF 2-33 personnel serve as evaluators for this event? Please identify evaluators in COMMENTS.	6	3	5	-internal self-evaluations, no real O/C for CTCP. -evaluated ourselves and had after ops hotwash AAR. -2LT Boone was O/C for OPFOR. No O/C for S2.
Did the evaluator(s) provide valid and credible observations?	4		10	
Was feedback focused on training objectives, meeting standards, and linked to the mission and essential mission tasks?	8		6	
Were lessons learned identified and helpful in sustaining and improving performance?	10		4	-internal AARs.

Section B. External Training

1. JANUS I Command Post Exercise (Conventional) (15-17 Feb)				
	YES	NO	N/A or MISSING	COMMENTS
Did you participate in the training? (If you check NO, skip to **2.**)	14	2	1	

	YES	NO	N/A or MISSING	COMMENTS
Were you proficient in conventional tasks and doctrine before training in this event?	11	3		-I had only been in my job 1 month. It was great OJT. -no experience in maneuver battalions. OD officer new to TF 2-33. -staff needed more of this training to prepare which it did.
Were the training objectives (mission, tasks, conditions and performance standards) clear?	14			
Did you receive orientation training on limitations and capabilities of the simulation, workstations, and/or software prior to starting this training event?	12	2	1	
Did you receive adequate hands-on practice with the equipment and simulation prior to start of the training event?	11	3		-I had only used Janus once before. -had used systems before.
Was training interrupted, i.e., equipment, simulator, or simulation breakdowns?	8	6		-crashes. -Janus breakdowns. -Janus went down intermittently-lost 1/2 day of training. -Janus went down several times.
Did equipment and/or simulation deficiencies or realism hinder your performance?	4	10		-CB/FM problems simulated CSS. -no CSS play.

	YES	NO	N/A or MISSING	COMMENTS
Did equipment layout/locations hinder your performance?	5	9		-workstations were very cramped for the number people needed for the exercise. -being within earshot of the TOC was not realistic. -the BN CDRs BCV was in a poor location and not set up as the actual BCV. -FSO should be located in S2/S3 area.. -configure how you would fight.
Did training conform to doctrine where appropriate?	14			
Were written materials (technical manuals, doctrinal references, handouts, etc.) available?	9	4	1	-cheat sheet would have been helpful.
Was training effective and efficient?	12	2		-from the misplacement of the BCV to software problems crippled the event. -for BN staff. -Janus is a great BN level & above trng asset.
Did the evaluator(s) provide valid and credible observations?	13	1		-excellent feedback by Warthogs. -outstanding O/C support by Warthogs.
Was feedback focused on training objectives, meeting standards, and linked to the mission and essential mission tasks?	13	1		-worried more about conventional tactics than digitized TTPs.
Were lessons learned identified and helpful in sustaining and improving performance?	14			

2. Task Force SIMUTA Training Exercise (Conventional) (31-Mar-2 Apr)				
	YES	NO	N/A or MISSING	COMMENTS
Did you participate in the training? (If you check NO, skip to **3.**)	14	2	1	
Were you proficient in conventional tasks and doctrine before training in this event?	13		1	-Proficient in ALOC procedures unproficient in personnel tracking/ a new system was being tested.
Were the training objectives (mission, tasks, conditions and performance standards) clear?	14			
Did you receive orientation training on limitations and capabilities of the simulation, workstations, simulators, and/or software prior to starting this training event?	10	3	1	-had no B2C2. -had used system before.
Did you receive adequate hands-on practice with the equipment and simulation prior to start of the training event?	11	2	1	-had used system before.
Did simulated equipment adequately replicate the real system hardware and software?	10	1	3	-except the radios-they were worthless.
Was training interrupted, i.e., equipment, simulator, or simulation breakdowns?	5	8	1	-radios. -IVIS constantly down, radios weak. -poor communications was a constant headache.
Did equipment/simulation deficiencies or realism hinder your performance?	4	9	1	-radios. -putting Cav Scouts in a tank simulator with no dismount capability is fruitless. -casualty station slowed the execution process down. Number of casualties overwhelmed the medical system.

	YES	NO	N/A or MISSING	COMMENTS
Did equipment layout/locations hinder your performance, (i.e., BCV, TOC, CTCP, etc.) ?	2	10	2	-could not effectively tie in CSS using real FM comms to CBs in MWSTC.
Did training conform to doctrine where appropriate?	12	1	1	-once again, a HMMWV Scout Platoon put in tank simulators (with no ammo) doesn't work.
Were written materials (technical manuals, doctrinal references, handouts, etc.) available?	12	1	1	
Was training effective and efficient?	12	1	1	-outstanding training. -SIMNET great training tool.
Did the evaluator(s) provide valid and credible observations?	12	1	1	-the Scout Platoon's mission was so inconsistent with doctrine that any credible observations were moot.
Was feedback focused on training objectives, meeting standards, and linked to the mission and essential mission tasks?	12	1	1	
Were lessons learned identified and helpful in sustaining and improving performance?	12	1	1	-learned many lessons on our new personnel tracking system. -provide written outbrief by O/C team.

3. Virtual Simulation I (VS1) (4 - 21 Apr)				
	YES	NO	N/A or MISSING	COMMENTS
Did you participate in the training? (If you check NO, skip to **4.**)	13	3	1	

	YES	NO	N/A	COMMENTS
Did you train as a member of a digitally-linked team? (If YES, please tell job duty and type of equipment in COMMENTS.)	13			-D Co/Tm Cdr w/IVIS. -S1, IVIS (broken most of the time), B2C2. -scout platoon leader, IVIS equipped. -S4 B2C2 with TOC, B Tm, Bde, Plans Cell. -as Asst S2 within TOC not in the BN CDRs Bradley. -TF C2V battle captain. -S3. -C Co Cdr collocated w/ModSAF operators. -BN S2 using ASAS linked to BDE S2 ASAS. -S3 Air C2V mockup. -chemo C2V mock up.
Were you proficient in conventional tasks and doctrine before training with digital equipment in this event?	13			
Were the training objectives (mission, tasks, conditions and performance standards) clear?	11	2		
Did you receive orientation training on limitations and capabilities of the simulation, simulators, workstations, and/or software prior to starting this training event?	7	6		-most systems failed to perform limiting what could be done.
Did you receive adequate hands-on practice with the equipment, simulators, and simulation prior to start of the training event?	8	5		-systems seldom worked.

	YES	NO	N/A or MISSING	COMMENTS
Did simulated equipment adequately replicate the real system hardware and software, ex. IVIS?	3	10		-there were some software differences between this system and the real IVIS. -IVIS was broken. -IVIS was down the entire time. -SRM breakdowns caused digital and FM breakdowns. -not enough systems available, not enough radio nets, not enough room. -Sincgars radio emulators didn't work which crippled the exercise from start to finish.
Was training interrupted, i.e., equipment, simulator, or simulation breakdowns?	13			-numerous crashes and lock ups. -crashes. -IVIS going down numerous times. -constantly. SRMs broke down constantly. Made IVIS inop. -frequent breakdowns. Little sit awareness provided in sim. -constantly. -simulators going down primarilly IVIS Base Station.
Did equipment/simulation deficiencies or realism hinder your performance?	10	3		-software problems could cause learning problems on real system. -I wasted countless hours waiting for the IVIS to be repaired. -constantly. SRMs broke down constantly. Made IVIS inop. -had to simulate tasks we would have performed.
Did equipment layout/locations hinder your performance, (i.e., BCV, TOC, CTCP, etc.) ?	7	5	1	-CTCP was an afterthought and therefore located in a corner. -CTCP was not in C2V mock-up and was stuck in the corner with little room to operate. -BCV setup crippled training to create TTPs in the BCV. -CTCP too small-could not get all personnel playing into it. -cramped. Because of breakdowns lots of interruptions by technicians.
Did training conform to doctrine where appropriate?	11	1	1	

	YES	NO	N/A or MISSING	COMMENTS
Were written materials (technical manuals, doctrinal references, handouts, etc.) available?	10	3		-received materials the week before VS1.
Was training effective and efficient?	4	9		-yes, but equipment/software/ interface problems hindered the training to a large extent. -waste of time for the CTCP. -too many breakdowns of SRMs. -no training provided by test director. -most time waiting for systems to be repaired.
Did the evaluator(s) provide valid and credible observations?	10	3		-O/C spt provided Warthogs is outstanding. -focused on non-digital, gave no input to digital. -they can't if they don't know how to use the systems.
Was feedback focused on training objectives, meeting standards, and linked to the mission and essential mission tasks?	12	1		-should have been related to digital ops.
Were lessons learned identified and helpful in sustaining and improving performance?	11	2		-no. The failure of the software crippled the event and soured people on the digitized environment--wasted time & effort. -for nondigital TTPs. -not for a digital BN.

4. JANUS III (22 May - 1 Jun)				
	YES	NO	N/A or MISSING	COMMENTS
Did you participate in the training? (If you check NO, skip to **General Comments.**)	13	2	2	

	YES	NO	N/A or MISSING	COMMENTS
Did you train as a member of a digitally-linked team? (If YES, please tell job duty and type of equipment in COMMENTS.)	12	1		-No IVIS at CO/TM level during Janus III. -B2C2. -scout platoon leader, IVIS equipped. -S4 B2C2 link. -mortar platoon leader (MFCS). -no ASAS in BCV level did participate while in the TOC as part of staff. -TF C2V battle captain. -S3. -BN S2 on ASAS to BDE S2 on ASAS. -S3A TOC. -chemo in TOC.
Were you proficient in conventional tasks and doctrine before training with digital equipment in this event?	13			
Were the training objectives (mission, tasks, conditions and performance standards) clear?	12	1		
Did you receive orientation training on limitations and capabilities of the simulation, simulators, workstations, and/or software prior to starting this training event?	7	6		-capabilities of the software were not found until midway through Janus III. -this really hurt me as the battle captain. If I had this training I could have done much more. -by LTC Ritter.
Did you receive adequate hands-on practice with the equipment, simulators, and simulation prior to start of the training event?	8	4	1	-this really hurt me as the battle captain. If I had this training I could have done much more. -included week long puckster tng. -only operators were trained on capabilities, leaders needed the training.

	YES	NO	N/A or MISSING	COMMENTS
Did simulated equipment adequately replicate the real system hardware and software, ex. IVIS?	6	4	3	-no IVIS involved. -but unit hard wired in B2C2, IFSAS, & ASAS (no IVIS). -did replicate what we should have beyond IVIS. -we used the Janus screen as our digital system.
Was training interrupted, i.e., equipment, simulator, or simulation breakdowns?	8	4	1	-Janus crash. -some breakdowns of Janus. -but not often. -mostly Janus breakdowns. -not very often but it did limit the CSS role to not be played. -Janus went down.
Did equipment/simulation deficiencies or realism hinder your performance?	1	11	2	
Did equipment layout/locations hinder your performance, (i.e., BCV, TOC, CTCP, etc.) ?	4	8	2	-CTCP was again within earshot of TOC, unrealistic. -BCV layout again was lacking. -could have integrated CSS more into scenario. -TOC should have been set up like C2V, BCV, etc. -not set like C2V.
Did training conform to doctrine where appropriate?	13		1	
Were written materials (technical manuals, doctrinal references, handouts, etc.) available?	10	3	1	
Was training effective and efficient?	12	1	1	-Janus is a great command and control tool. -this was our first real success using digital equipment. -incredible amount of training and capabilities that are a must for Force XXI.
Did the evaluator(s) provide valid and credible observations?	12	1	1	-all focused on non-digital not digital.

	YES	NO	N/A or MISSING	COMMENTS
Was feedback focused on training objectives, meeting standards, and linked to the mission and essential mission tasks?	13		1	-needed to be focused on digital ops & digital METL..
Were lessons learned identified and helpful in sustaining and improving performance?	12	1	1	-only for non-digital processes.

General Comments:

- All commanders should have received NET training along w/B TM. Digital Learning Center is a must for training.
- I think Janus has a lot of promise in the future. It was the only train-up for the Virtual-Live Experiment that made for a positive learning experience.
- Excellent training event. Downfall was key leaders were not familiar with new version of Janus (limitations & capabilities). Could have done much more if known rather than just showing pucksters.
- Best system capabilities identified for IVIS, B2C2 to date. Has ASAS like capabilities with situational awareness.